DRAFT FINDING OF NO SIGNIFICATION IMPACT AND ENVIRONMENTAL ASSESSMENT for the BOSQUE WILDFIRE PROJECT, BERNALILLO and SANDOVAL COUNTIES, NEW MEXICO

JULY 2004

US Army Corps of Engineers®
Albuquerque District

Prepared by:
U.S. Army Corps of Engineers, Albuquerque District,
4101 Jefferson Plaza NE, Albuquerque, New Mexico 87109

U.S. ARMY CORPS OF ENGINEERS
ALBUQUERQUE DISTRICT

FINDING OF NO SIGNIFICANT IMPACT
for the

BOSQUE WILDFIRE PROJECT
BERNALILLO and SANDOVAL COUNTIES, NEW MEXICO

Under the authority of Public Law 108-137, work under the Bosque Wildfire Project would include the following within Bernalillo and Sandoval Counties: selective thinning of areas with high fuel loads and/or non-native plant species populations; removal of jetty jacks and debris piles; improvement of emergency access in the form of drain crossings, levee road improvement, and construction of turn-arounds; and revegetation of burned and thinned areas in the Albuquerque Reach of the Rio Grande bosque, the Corrales Bosque Preserve, and locations within and as identified by the Pueblos of Sandia and Isleta. Combinations of these alternatives were considered but implementation of all components was deemed necessary to meet the overall purpose and need of the project, which is to undertake appropriate planning, design and construction measures for wildfire prevention and restoration in the Middle Rio Grande bosque in and around the City of Albuquerque. Work shall be directed toward those portions of the bosque (riparian area), which have been damaged by wildfire or are in imminent danger of damage from wildfire due to heavy fuel loads and impediments to emergency vehicle access.

The planned action would result in only minor and temporary adverse impacts on air quality, soils, aesthetics, vegetation, wildlife, recreational resources, water quality, and noise levels during implementation. The long-term benefits of the proposed project would outweigh these short-term adverse impacts. The following elements have been analyzed and would not be significantly affected by the planned action: socioeconomic environment, air quality, hydrology and hydraulics, water quality, noise levels, floodplains, riparian areas, wetlands, waters of the United States, biological resources, endangered and threatened species, prime and unique farmland, and cultural resources.

If thinning of fuels and non-native vegetation, jetty jack and debris removal, emergency access improvement and revegetation did not occur, a hazard to fire prevention and suppression would remain. In order to maintain the area with a lower density of vegetation to prevent fires but also provide wildlife habitat by replanting with native vegetation, the Proposed Action is essential.

The planned action has been fully coordinated with Federal, State, tribal and local governments with jurisdiction over the ecological, cultural, and hydrologic resources of the project area. Based upon these factors and others discussed in the Environmental Assessment, the planned action would not have a significant effect on the human environment. Therefore, an Environmental Impact Statement will not be prepared for this project.

_____ _____

Date

Todd Wang
Lieutenant Colonel, U.S. Army
District Engineer

DRAFT ENVIRONMENTAL ASSESSMENT FOR THE BOSQUE WILDFIRE PROJECT, SANDOVAL AND BERNALILLO COUNTIES, NEW MEXICO

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

Appendices

Figures

Tables

1.0 Introduction

1.1 Project Location and Background

Subsequent to years of devastating floods in the Middle Rio Grande valley, the U.S. Army Corps of Engineers (Corps) and the Bureau of Reclamation (BOR) were authorized by the U.S. Congress to develop and implement a comprehensive plan for flood control and water conservation under the provisions of the Flood Control Act of 1948 (Public Law ([P.L.] 858). The Act tasked the Corps with the construction of flood control reservoirs, installation of jetty jacks and rehabilitating, modifying, and extending the levee system within the Middle Rio Grande Project Facilities area. The BOR was responsible for clearing a floodway and installing jetty jack fields (i.e., Kellner Jetty Jacks) to establish and confine the river to a stable channel. This was the initial involvement of the Corps within the Middle Rio Grande.

In the summer of 2003, two fires took place in the bosque in Albuquerque. The Atrisco fire began on June 24, 2003, near the Interstate 40 (I-40) Bridge and burned approximately 150 acres. The Montaño fire began on June 26, 2003 near the Montaño Bridge and burned approximately 113 acres. A total of approximately 263 acres within the Rio Grande Valley State Park and on private land, were burned (Figure 1). The Corps was initially requested to assist with restoration of these burn areas and other work needed to improve access and prevent future fires. Therefore, in January of 2004, the Corps was authorized to assist local efforts of this type. Pursuant to the authority of Public Law 108-137, Operations and Maintenance, Section 116, which states: "the Secretary of the Army, acting through the Chief of Engineers, is authorized to undertake appropriate planning, design and construction measures for wildfire prevention and restoration in the Middle Rio Grande bosque (the riparian area which is the banks or floodplain area along a waterway) in and around the City of Albuquerque. Work shall be directed toward those portions of the bosque (riparian area) which have been damaged by wildfire or are in imminent danger of damage from wildfire due to heavy fuel loads and impediments to emergency vehicle access."

Under the authority stated above, work under the Bosque Wildfire Project would include the following within Bernalillo and Sandoval Counties:

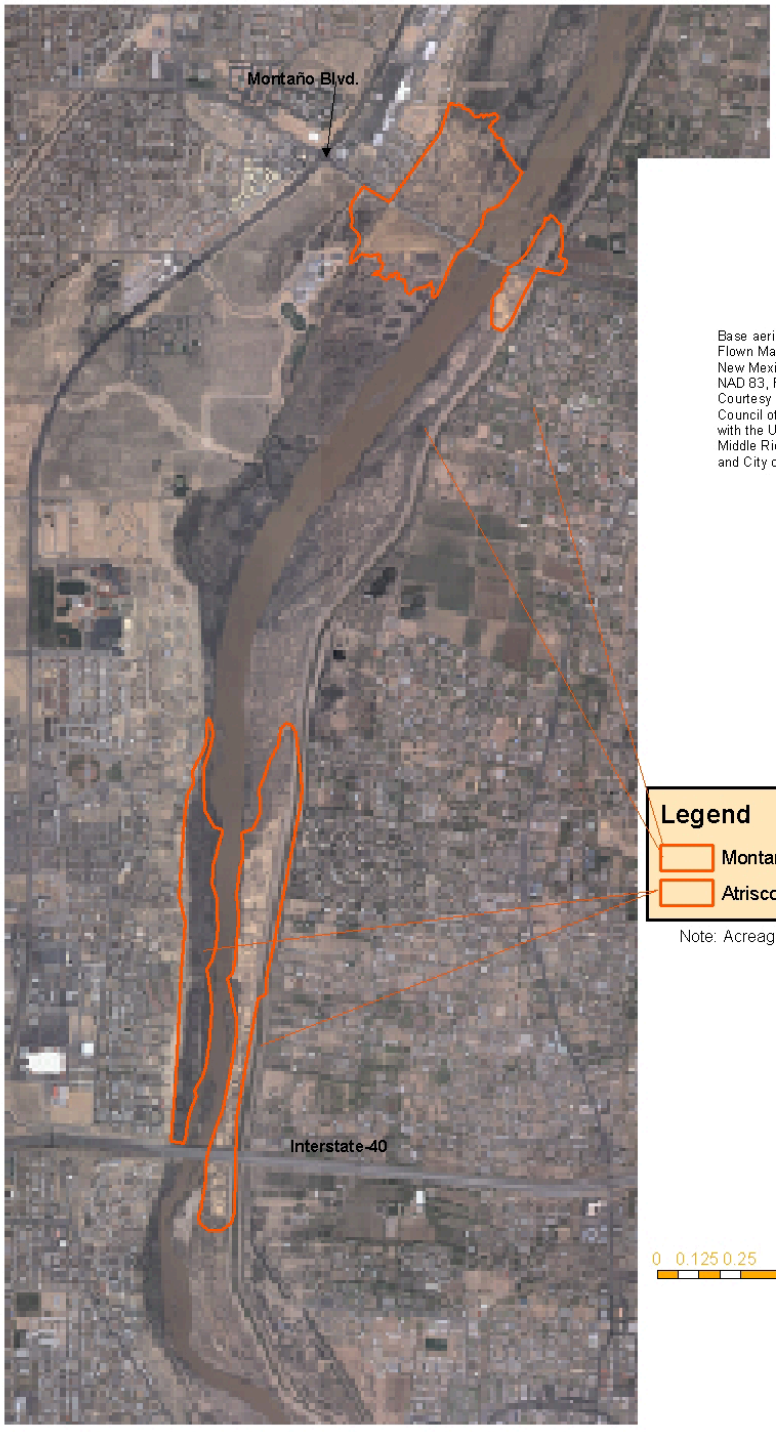
- selective thinning of areas with high fuel loads and/or non-native plant species populations;
- removal of jetty jacks and removal of debris;
- improvement of emergency access in the form of drain crossings, levee road improvement, and construction of turn-arounds; and
- revegetation of burned and thinned areas.

The project area includes the Albuquerque Reach of the Rio Grande bosque (also called the Rio Grande Valley State Park [RGVSP]), the Corrales Bosque Preserve, and locations within and as identified by the Pueblos of Sandia and Isleta (Figure 2). A more detailed view of the project locations are shown in Figures 3A-3C at the end of the document (following page 73).

This project has been closely coordinated with the City of Albuquerque Open Space Division (OSD), the Middle Rio Grande Conservancy District (MRGCD), Corrales Bosque Preserve, Village of Corrales, the Pueblo of Sandia, the Pueblo of Isleta, New Mexico State Forestry Division and others.

Figure 1 - Bosque Wildfire
June 2003 Fires

US Army Corps of Engineers®
Albuquerque District
Environmental Resources Section



Base aerial photography:
Flown March 2004
New Mexico State Plane (Central)
NAD 83, Feet (U.S.)
Courtesy of the Middle Rio Grande Council of Governments in partnership with the US Army Corps of Engineers, Middle Rio Grande Conservancy District and City of Albuquerque

Legend

- Montaño Fire = 113 Acres
- Atrisco Fire = 150 Acres

Note: Acreages are approximate

Miles
0 0.125 0.25 0.5 0.75 1

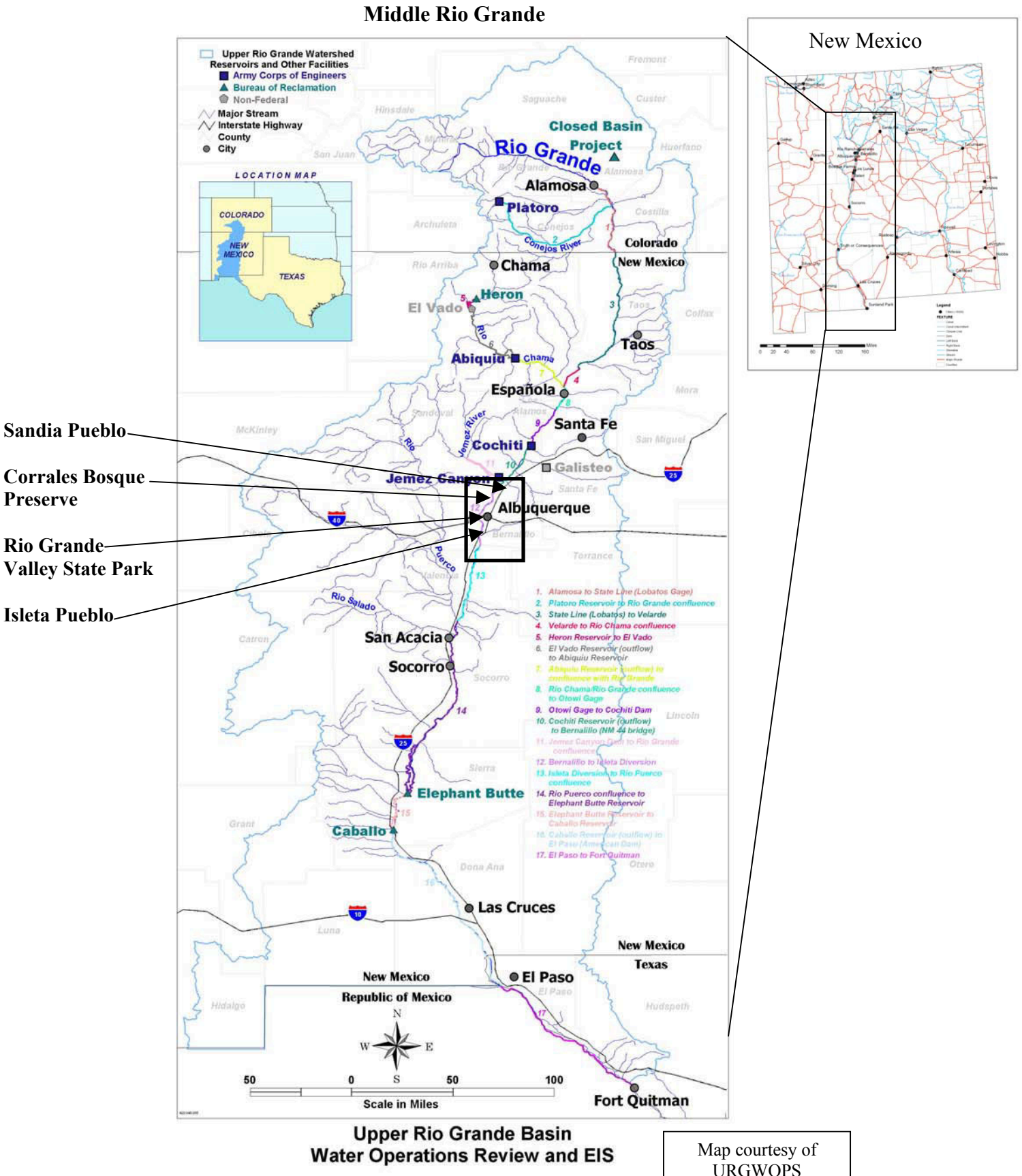


Figure 2. Project Location Map

1.2 Purpose and Need

Authorization for the Proposed Action is contained in Public Law 108-137, as stated above. The need for the project is crucial based on the fires that have occurred in 2003 and 2004. High fuel loads that have accumulated over the past 50 years and growth of non-native species have added to the danger of fire in the bosque. Over the last five to ten years, this threat has grown due to drought conditions throughout the west causing the build-up of dead material to become extremely dry. This was apparent during the fires in 2003 and also two fires that recently occurred: one on June 10, 2004, burning 63 acres in the south end of the RGVSP, and one on June 23, 2004 that burned approximately 18 acres near the National Hispanic Cultural Center (NHCC). Three structures were also lost during the June 11 fire. Because of the proximity of structures to the bosque, the threat to human health and property is of imminent concern. Jetty jacks are a hindrance to both reducing the threat of fire and access when a fire occurs. Therefore, reducing the fuel loading in the bosque, as well as improving access where needed in case a fire were to break out, are of the utmost importance and the main purpose of this project. Additionally, vegetative restoration in already burned or treated areas is necessary to preserve suitable wildlife habitat value.

1.3 Related Activities

Under the authority stated above, efforts to date by the Corps include:

- Removal of 675 jetty jacks and 950 dead stumps in the areas that were burned in 2003 (shown in Figure 1) which was documented in the "Supplemental Environmental Assessment to the Middle Rio Grande Bosque Jetty Jack Removal Evaluation Study Environmental Assessment, April 2004" (USACE, 2004a) and
- The installation of 3 temporary emergency drain crossings and emergency levee road rehabilitation which was documented in the "Supplemental Environmental Assessment for Temporary Emergency Bridges and Levee Operations and Maintenance, Bosque Wildfire Project, City of Albuquerque, Bernalillo County, New Mexico, June 2004" (USACE, 2004b).

Additional non-Federal efforts under the same purpose of fire prevention and bosque restoration are underway by the OSD in terms of thinning of dead wood and non-natives in order to prevent fires during the 2004 fire season. Approximately $2 million dollars of both state and City funds have been spent to hire contractors and utilize OSD crews to thin high priority areas. The Ciudad Soil and Water Conservation District (SWCD) have also completed some thinning at locations near the Rio Grande Nature Center and the NHCC. Approximately 2000 acres within the RGVSP have been cleared or thinned in the past year.

Within the Pueblo of Sandia Reservation, several bosque areas under Phase C (see below) have been thinned by the Pueblo (approximately 130 acres thinned and 12 acres of burn restoration). Sandia Pueblo is continuing to pursue fire prevention efforts.

Within the Corrales Bosque Preserve, a small amount of thinning work (approximately 20 acres) and burn restoration has also taken place.

1.4 Regulatory Compliance

This Draft Environmental Assessment (DEA) was prepared by the U.S. Army Corps of Engineers, Albuquerque District in compliance with all applicable Federal statutes, regulations, and Executive Orders, including the following:

- Clean Air Act of 1972, as amended (42 U.S.C. 7401 *et seq*.)
- Clean Water Act of 1972, as amended (33 U.S.C. 1251 *et seq*.)
- Endangered Species Act of 1973, (ESA) as amended (16 U.S.C. 1531 *et seq*.)
- National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 *et seq*.)
- Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980, amended by Superfund Amendments and Reauthorization Act (SARA) in 1986, 42 USC 9601 et seq.
- Resource Conservation and Recovery Act (RCRA) of 1976, amended by Hazardous and Solid Waster Amendments in 1984, 42 USC 6901 et seq.
- Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 *et seq.*)
- Procedures for Implementing NEPA (33 CFR 230; ER 200-2-2)
- Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Executive Order 12898)
- Farmland Protection Policy Act (P.L. 97-90)
- Floodplain Management (Executive Order 11988)
- Protection of Wetlands (Executive Order 11990)
- National Historic Preservation Act of 1966, as amended (16 U.S.C. 470a *et seq*)
- Protection of Historic and Cultural Properties (36 CFR 800 *et seq*)
- Protection and Enhancement of the Cultural Environment (Executive Order 11593)
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 *et seq*)
- Archeological Resources Protection Act of 1979 (16 U.S.C. 470)
- Environmental Justice (Executive Order 12898)
- Federal Weed Act of 1974 (Public Law 93-269; U.S.C. 2801)
- Migratory Bird Treaty Act of 1918

This DEA also reflects compliance with all applicable tribal, State of New Mexico and local regulations, statutes, policies, and standards for conserving the environment and environmental resources such as water and air quality, endangered plants and animals, and cultural resources.

2.0 Descriptions of the Proposed Action and Alternatives

2.1 Proposed Action

The Proposed Action would be to treat areas for removal of non-native vegetative species, specifically salt cedar (*Tamarix ramosissima*), Russian olive (*Elaeagnus angustifolia*), Siberian elm (*Ulmus pumila*) and Tree of Heaven (*Ailanthus altissima*), and reduce fuels in areas of high fuel loads within the Albuquerque, Corrales and Sandia Pueblo bosques as noted on Figures 3A – 3C (at the end of this document following page 73). This would occur by a number of methods discussed below in Section 2.1.1. Jetty jacks within the bosque also would be removed where they have been determined to be unnecessary. Access improvements in the form of levee road rehabilitation, installation of turn-arounds or ramps, and construction of drain crossings would also occur. Where appropriate, areas would be revegetated with native riparian grass, shrub and tree species. Work would take place over an 18-month period from September 2004 through March 2006.

TABLE 1. PROPOSED ACTION

Action Type	**Quantity**
Non-native vegetation and fuel wood thinning	850 acres
Jetty jack removal	Across 1375 Acres
Revetment	As needed
Levee rehabilitation	Up to 41 miles
Drain crossings	15 locations
Dry hydrant installation	6 locations
Revegetation	1375 acres

2.1.1 Fuel Reduction, Non-native Tree Thinning and Jetty Jack Removal

The thinning and jetty jack removal activities have been broken down into four phases of work:

- Phase A. High priority areas to be worked in beginning September 2004 include those that have already been mostly cleared or burned and do not have any overstory vegetation. In these areas, existing jetty jacks can be readily removed with little to no disturbance. There are approximately 63 acres of this type in the Albuquerque area. The exact number of jetty jacks within this acreage is unknown at this time. These areas were established as high priority due to the fact that although they have already been thinned, there are remaining adjacent areas that have not been thinned and need access in order to do so and/or fight a fire if one were to occur.
- Phase B. There are a number of locations that have not been thinned by removing fuels and/or non-natives and are a high priority to do so. This thinning as well as jetty jack removal and debris removal would take place. There are approximately 190 acres of this type in the Albuquerque area and 120 acres in the Corrales Bosque Preserve. These areas have extremely high fuel loads, jetty jacks impeding access, and/or debris piles (namely the Central SE location has piles of asphalt and concrete mixed in with the jetty jacks). Therefore, they were established as high priority for thinning and access improvement to occur beginning in September 2004.
- Phase C. The third priority areas are those that have been thinned by the OSD or Sandia Pueblo but cottonwood and other tree canopy remains. There are approximately 318 acres of this type in the Albuquerque area and 142 acres on Sandia Pueblo, but the

number of jacks within this acreage is unknown at this time. These areas have been thinned and the fuel load has been reduced but access improvements and revegetation still needs to occur. Since there is existing native vegetation, these areas need to be treated more sensitively.

- Phase D. There are a number of sites that need additional attention in terms of thinning of fuels and non-native vegetation. These sites would be treated beginning in September 2005 and include approximately 320 acres in Albuquerque and approximately 500 acres in Sandia Pueblo. These locations were included in a later Phase to balance thinning and revegetation efforts in terms of effects to habitat and wildlife. Therefore, they were ranked as a lower priority to allow time for other high priority areas to be thinned and native vegetation to be re-established.

Treatment Methods

There are a number of methods for reducing fuel loads and treating non-native vegetation that have been and are being utilized in the Middle Rio Grande and throughout the Southwest. These methods include both manual and mechanical treatment methods, which are described below. Follow-up treatment with herbicides or root ripping are also options.

Manual treatment

Using this method, dead material would be piled up and/or processed by cutting into smaller chunks using a chain saw. Large material would be hauled off, some for use as fire wood. Smaller material would be chipped using a chipper on site. Chips would either be tilled into the ground prior to revegetation or hauled off depending on the density. No more than 2 inches of chipped material would be left on site. The stump of any live non-native trees that is cut would be treated immediately with herbicide (if not ripped out by the roots – see Mechanical treatment below) See Section 3.2 below for a discussion of herbicide treatment.

Mechanical treatment

Mechanical control entails the removal of aerial portions of the tree (trunk and stems) by large machinery such as a tree shear or large mulching equipment. Both dead material and live non-native trees could be treated mechanically. This would leave the base of the tree exposed. The stump or tree could be ripped out mechanically if possible. Where possible, trees would be ripped out whole. Otherwise, the stump would be treated immediately with herbicide. Material would be processed as stated above – large material would be hauled off and smaller material would be chipped.

Combination treatment

The most efficient methodology for treatment of dead material and non-native vegetation is usually a combination of manual treatment, mechanical treatment and use of herbicide. Some areas may be very thick and the use of manual methods allows them to be opened up for machinery access. Then mechanical equipment can take over while hand crews can move ahead of machinery to keep areas open enough to work in without damaging native vegetation to remain. The methodology to be implemented at each location will be evaluated on a site-by-site basis, and adaptively managed. Specific prescription components to be followed are listed in Appendix A.

Treatment of Non-Native Resprouting Vegetation

Where OSD contractors or crews have already worked, a fair amount of resprouting of non-native vegetation is occurring. These resprouts would be treated with either herbicide or by root-ripping prior to revegetating the area with native species. Also thinning and removal of non-native vegetation under this Proposed Action would include herbicide treatment in many locations. Herbicide application would be used where root ripping is not an option. Herbicide would be immediately applied to the base using a backpack sprayer, hand application with a brush, or other equipment that allows direct application. Options for herbicide include Arsenal® or Garlon®. Each of these herbicides is evaluated in Section 3.2 below.

Revegetation

Most areas addressed would be replanted with native riparian vegetation. Preparation for revegetation would include grubbing and disking where needed, especially if a large amount of chipped material remains that needs to be processed. Areas would first be seeded with native grass either between June-August or February-March. Wood debris such as large logs remaining after fires or from thinning would be placed strategically in order to provide additional habitat once seeding is completed. Shrubs would be planted in the fall and trees would be planted in the winter. Areas that have already been thinned by OSD contractors and crews are a priority for revegetation. Where appropriate, moist soil depressions would be created to assist recovery of native vegetation. Some of the typical vegetative species that would be planted include: New Mexico olive (*Forestiera neomexicana*), indigo bush (*Amorpha fruticosa*), gray baccharis (*Baccharis salicacea*), golden currant (*Ribes aureum*), Rio Grande cottonwood (*Populus deltoides* var. *wislizenii*), black willow (*Salix goodingii*), peachleaf willow (*Salix amygdaloides* var *wrightii*), coyote willow (*Salix exigua*), as well as a native grass seed mix.

2.1.2 Jetty Jack Removal

Some degree of jetty jack removal is proposed at all locations shown in Figures 3A-3C. Removal of the jetty jacks would be completed in conjunction with fuel reduction and thinning of non-native vegetation where not already complete in order to minimize disturbance. Where tieback lines are removed, new anchors would be installed to insure remaining bank lines would not migrate from their current position. Jetty jacks to be salvaged would be stockpiled on site during construction and removed prior to the completion of construction.

It has been determined by the Corps that the jetty jacks identified for removal in this Proposed Action can be removed with a low impact based on the proposed revegetation. The Authorization for Removal of Jetty Jacks form (see Appendix B) has been signed by all pertinent parties to approve removal of jetty jacks at all locations in Phase A and B (locations on Sandia Pueblo, Montaño to Alameda, Central to I-40, and Bridge SE as shown on Figures 3A and 3B). This same documentation will be obtained for locations in Phases C and D prior to removal of jetty jacks at those sites.

As a result of the Middle Rio Grande Bosque Jetty Jack Removal Evaluation Environmental Assessment (USACE, 2002), a combination of experience and knowledge was gained that will greatly assist in future efforts. Various methods of jetty jack removal were tested and used resulting in a method that appears to be the most efficient and effective. These methods and

others were tested during removal of jetty jacks at I-40 and Montaño in the burn sites. Procedures for removal based on the level of depth below the soil have been established at this time and would be implemented throughout this project.

In a report entitled "Assessment Report on the Feasibility of Jetty Jack Removal Along the Middle Rio Grande River, Albuquerque, New Mexico" (USACE, 2004c), prepared by U.S. Army Corps of Engineers, St. Louis District, Hydrologic & Hydraulics Branch, Potamology Section, Applied River Engineering Center, an excerpt from that report addresses the issue of jetty jack removal as follows:

> "It has been estimated that over 20,000 Kellner jetty jacks were installed on the floodway and along the banklines of the Middle Rio Grande River through the reach within the City of Albuquerque, New Mexico. The jacks were placed in the floodway at a time when the Rio Grande was aggrading, as evidenced by a highly braided planform. The jacks were successful in establishing stable banklines, assisting in the development of a vegetated floodway, and providing erosion protection of the urban levees that surround Albuquerque. When the Cochiti Dam was constructed in the early 1970's, the Rio Grande transitioned into a degrading state due to the reservoir capturing nearly 80% of the sediment load in the Rio Grande. The dam's ability to significantly reduce sediment dictated against further jetty jack installation. The usefulness of the jetty jacks was reduced by the lack of the substance that had allowed the structures to function properly."
>
> "From a river engineering perspective, many of these jacks can be safely removed from the floodway without adversely effecting stability of the river channel or the urban infrastructure that surrounds the bosque. Further evaluation and special care should be taken when considering the removal of the jacks buried along the riverbanks. Many of these structures may be preventing channel meandering into unwanted areas. Even if jacks are removed for environmental reasons in areas without local consequences, there are downstream effects to consider. Jacks removed that increase meandering in a particular upstream area can significantly alter the river channel's alignment in an adjacent downstream area. Careful examination of jack removal should include an analysis of local changes as well as possible changes that could be induced in the river channel downstream."

For the reasons stated in this report, only the overbank or floodway jetty jacks are being considered for removal. All bankline jetty jacks are to remain in place for this proposed work. The construction activities would not impact existing floodway infrastructure other than the jetty-jacks that have been identified for removal.

2.1.3 Debris Removal

Large piles of construction debris are prevalent around the Central and Paseo del Norte bridges. Concrete and asphalt were 'dumped' in these areas before the area was designated a State Park. Project areas fall within these areas and this debris will be removed, specifically at Central SE (B10), along the east side of the river between Central heading north to I-40 (C16, C15, A5 and C14) and Paseo del Norte NE (A3 and C22). If construction debris is encountered in other

project areas, it will be removed. Where large piles of garbage exist, this will also be removed, specifically at Central NW (C27) and Bridge NE (C28). When feasible, material will be recycled. Much of the concrete that had been cleaned up along Tingley Drive by OSD was recycled and the same procedures will be followed during this project.

2.1.4 Levee Bank Protection

At some locations close to bridges, the levee or other structures may need additional levee bank protection (revetment) once the jetty jacks are removed. The revetment is expected to be a 1.5-2 foot-thick riprap blanket. At the toe of the slope (or levee) the riprap would be buried from 3 to 5 feet deep vertically to form a cut off wall. Additionally, the riprap would be stone with at least two fractured faces so it won't roll off the slope. The riprap would extend approximately 2/3 of the way up the slope of the levee. It would be expected that in most cases the slope of the levee would be covered except for the upper two feet. A geotextile filter fabric lining would be placed under the rip-rap blanket with a minimum 3-inch layer of bedding material (usually sand) placed between the filter fabric and rip-rap. Prior to placement of the filter fabric the sub grade should be compacted to a minimum density of 90% per ASTM D-1557, to a minimum depth of 6 inches. The rip-rap stone size at each site would be determined based on the expected water velocity at the design flow rate.

One location that would specifically need revetment is at the Montaño Bridge on the north side of the bridge and east side of the river, where jetty jacks were removed from the burn area. The jetty jacks that remained in the floodway were removed in June 2004. Those jetty jacks buried within the riverbanks were left for further analysis. The bridge abutment extends perpendicularly out from the levee and is only partially protected with revetment. The interior corner created by the intersection of the levee and the abutment requires additional revetment due to the scour that could develop here during overbank flows. It is recommended that the revetment be extended to the north along the levee to protect it from overbank flows. The low swale located along the riverside toe of the levee could encourage higher velocity flows to scour the earthen levee during overbank events. In addition, the levee is located only 250 feet from the riverbank. Therefore, the constriction caused by the bridge abutment, along with the position of the levee requires that additional stone protection be added to the levee for stability. Revetment would be placed on the toe of the levee and up the face, 2/3 the height of the levee. It would be placed continuously along the bridge abutment, through the transition into the levee and upstream approximately 300 feet.

The riverbanks adjacent to the levee and the bridge abutments would be monitored for future migration tendencies. If the jetty jacks embedded in these banks are undercut and fail, the river could begin to migrate towards the levee. If this should occur, the riverbank would immediately be stabilized with stone revetment. If significant migration occurs before the bank can be protected, the riverbank would be rebuilt into its current configuration to maintain the protective offset between the levee and the river.

2.1.5 Access Improvements

There are several impediments to emergency vehicle access within the RGVSP, Corrales Bosque Preserve, Sandia Pueblo bosque, and Isleta Pueblo bosque. The levees within these areas total approximately 41 miles with a limited number of crossings over the drain to the levee and bosque. Some existing access points have sharp turns that large fire trucks cannot negotiate, thus prohibiting access. Several levee roads need general maintenance to fill in potholes and resurfacing to ensure large fire equipment can safely drive on them (Figure 4). In some locations, the levee is not engineered. Improvements to the levee system in the form of general maintenance would occur along this 41 miles where required.

FIGURE 4. EXAMPLE OF LEVEE ROAD IN NEED OF REPAIR.

2.1.6 Drain Crossings

During the fires that took place in 2003, access became a limiting factor. Fire crews were unable to access the levee and bosque through neighborhoods due to the lack of crossings over the drain. Therefore, nine locations will be receiving temporary emergency drain crossings in the Albuquerque area to increase access during the fire season (as discussed in the Supplemental Environmental Assessment for Temporary Emergency Bridges and Levee Operations and Maintenance, [USACE, 2004]). These crossings (listed in Table 2) would be converted to permanent bridges in the Proposed Action, some providing pedestrian access as well (see Figures 3A-3C for locations). This would allow access from the street system across the riverside drain and onto the levee road adjacent to the bosque. The City of Albuquerque Fire Department identified these emergency temporary riverside drain bridge locations in the Albuquerque area during a field visit with the Corps. Locations were chosen on the basis of current access points and the accessibility from existing rights-of-way or streets. There are also five locations in the Corrales Bosque and three locations in the Sandia Pueblo that would also receive permanent

drain crossings (see Figure 3A, Table 2). All locations would be coordinated with any private landowners as needed. These are high priority locations due to past fires near these locations and/or due to existing crossings that are no longer functional and need replacement. The Corps proposes to construct these riverside drain bridges, perform levee maintenance and maintenance on roads from the levee to the bosque. All Corps activities are limited to Middle Rio Grande Project Facility (commonly referred to as MRGCD facilities) rights-of-way. The location and construction of all drain crossings would be coordinated with and approved by MRGCD.

Bridges would be built on-site from a pre-engineered, prefabricated steel truss bridge with a steel or concrete deck. Bridges would be approximately 18' wide x 50-60' span, and would support a fully loaded Type 1 fire engine. Metal or reinforced concrete culverts would be placed in the riverside drain where there is not enough room for a bridge.

Each bridge site has different existing conditions and considerations that need to be addressed. Where needed, each bridge would have a locked chain link or pole gate placed in front of them so that only emergency vehicles would have access to the levees at these new locations. No unauthorized vehicle access would be allowed on these structures. A sign will be placed on each gate that alerts individuals that vehicular access is for emergency vehicles only. Pedestrian access from existing neighborhoods or parking areas only will be allowed on these drain crossings. No new parking or access facilities are proposed.

TABLE 2. LOCATIONS OF PROPOSED BRIDGES TO CROSS THE RIVERSIDE DRAIN (FROM NORTH TO SOUTH)

Bridge Name	**Direction from Major Crossings**
Sandia Pueblo	
River Road 1	
River Road 2	
Albuquerque Drain 1	
Corrales Bosque Preserve	***In Priority order for Corrales Bosque Preserve area***
Dixon Road	Where Dixon Road dead-ends at the Riverside Drain
Andrews Lane	Where Andrews Lane dead-ends at the Riverside Drain
East Alary	Where East Alany dead-ends at theRiverside Drain
Paseo de Dulcelina	Where Paseo de Dulcelina dead-ends at the Riverside Drain
East La Entrada	Where East La Entrada dead-ends at the Riverside Drain
Rio Grande Valley State Park	***East Side of Rio Grande***
Gabaldon at I-40	North of I-40, at the west end of Gabaldon Place
Southside Water Reclamation Plant	At the City of Albuquerque Southside Water Reclamation Plant (SWRP)
Clark	South of Rio Bravo, west end of Clark Road
Barr Drain at I-25	North of I-25, at the west end of MRGCD's Barr Drain
Rio Grande Valley State Park	***West Side of Rio Grande***
Atrisco	North of Central Avenue, at MRGCD siphon crossing
Arenal	South of Bridge Street, east of the of Arenal Road and La Vega Drive intersection
Durand Open Space	East of Isleta Boulevard, South of Metzgar Road
Louise	North of I-25, east of Isleta Boulevard

2.1.7 Dry Hydrants

Installation of dry hydrants is proposed in six locations in the Corrales Bosque Preserve (see Figure 3A). Dry hydrants are used in the Village of Corrales due to the lack of fire hydrants. Since there is an existing ditch system throughout the Village, dry hydrants have become a useful alternative. Water flowing through the ditch system can be utilized during an emergency. A dry hydrant is a non-pressurized system permanently installed into an existing natural water supply (EMNRD, n.d.). The installation of a pipe system into these water sources provides a ready means of a suction supply of water to tank trucks were a fire to occur. One end of the dry hydrant sticks out of the ground to give tankers a hose connection, and the other end is a strainer submerged in the water supply directly through the system (EMNRD, n.d.). The dry hydrant can be made of any hard, permanent material (steel, iron); however PVC (polyvinyl chloride) has become commonly used. An example of a dry hydrant construction is shown in Figure 5.

Since there would be ground disturbance during construction of these access improvements and fuel reduction/exotic thinning efforts, Best Management Practices (BMPs) to minimize air quality disturbance would be employed. These include tracking out of material by covering trucks to avoid fugitive dust violations; maintaining and sweeping public trails to keep them free of debris and dust; and wetting down work areas. Speed limits on levee roads would be limited to 15 mph, which would also minimize dust.

Prior to construction of access improvements, all environmental protection measures as expressed by contract clauses, design drawings, or other means would be reviewed with the contractor at a pre-construction conference. All construction activities would be in compliance to all applicable Federal, State, tribal and local regulations, and all required permits would be obtained.

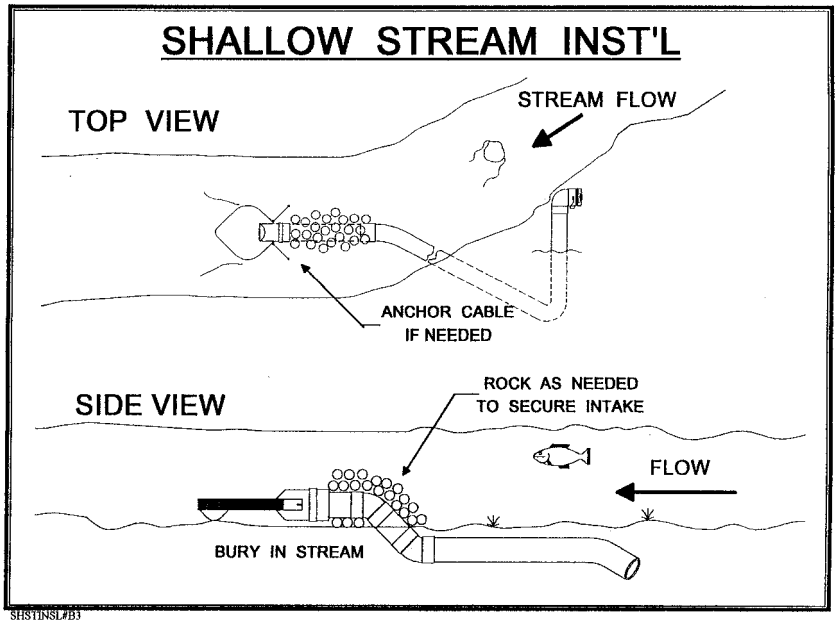


FIGURE 5. DRY HYDRANT CONSTRUCTION EXAMPLE (EMNRD, N.D.)

2.2 Future without project (No-Action Alternative)

If the Proposed Actions of thinning of dead plant material and non-native vegetation; access improvements in the form of jetty jack removal, levee road improvement, drain crossings and dry hydrant installation; and revegetation with native species did not occur then the fire hazard level would remain the same, if not increase, and the potential to fight imminent fires would remain low.

If thinning of non-native vegetation and woody debris did not occur then this potential fuel would remain in place. This material should be thinned out and removed in order to maintain a native bosque at low fuel levels to reduce the threat of catastrophic fire and maintain a healthy ecosystem for wildlife.

If jetty jack removal did not occur, they would remain a hazard to fire prevention and suppression were another fire to occur. It is difficult for fire crews, fire equipment and emergency vehicles to gain access to fires with the presence of jetty jacks. They are also a hindrance to maintenance of the bosque to reduce the threat of fire. In order to maintain the area with a lower density of vegetation to prevent fires but also provide wildlife habitat by replanting with native vegetation, the removal of jetty jacks is essential to a maintainable bosque.

If levee road improvement and other access improvements did not occur, then maintenance of these areas at low fuel levels could not occur. If a fire were to occur, access would remain severely limited and fires would continue to travel out of control due to lack of fire suppression ability because of poor access.

Without revegetation of the bosque with native species, a more 'natural' riparian area would not establish. Native species help maintain the dynamic ecosystem in a mosaic of structure and function that is more naturally resistant to fire than their non-native counterparts. Revegetation of these areas would aid in the long-term function of this ecosystem to in order to reduce the threat of future fires.

2.3 Alternatives Considered

Alternatives considered included single portions of the Proposed Action described above. For example, access improvement was a high priority and was considered on its own. But, access improvement without thinning and revegetation would not reduce the overall threat of fire. It would only provide better access were a fire to occur. Conversely, just thinning and revegetating areas without improving access by jetty jack removal and other items listed could potentially aggravate the problem by not allowing access to maintain the area at a low fuel level or safely fight a fire if one were to occur. Therefore, all components described above are needed in order to accomplish the overall purpose, need and objectives of the project.

3.0 Existing Environment and Foreseeable Effects

3.1 Physiography, Geology and Soils

The proposed project is in the Middle Rio Grande valley, a wide floodplain of fertile bottomland (USDA 1977). These fertile soils and shallow water tables support vegetation as well as a variety of resident and migratory wildlife. The Rio Grande valley is a productive agricultural area that contributes to the quality of life and economies of the urban areas of Albuquerque, Corrales, and Bernalillo, New Mexico, as well as several other smaller communities.

The Rio Grande follows a well-defined geologic feature called the Rio Grande graben. The Rio Grande graben contains several thousand feet of poorly consolidated sediment of the Santa Fe Group of middle Miocene to Pleistocene age.

The terrain in the area is characterized by gently sloping plains from the east to the Rio Grande ranging from about 4,860 feet to 4,875 feet in elevation. Water tables are typically four to five feet in depth and permeability is moderate (USDA 1977). The general soil conditions are deep, nearly level, well-drained soils that are formed in recent alluvium, on floodplains of the Rio Grande.

The major soil series, which occur within the proposed planning area, are described in the following discussions. The information in this section was obtained from the soil survey for Bernalillo County (USDA 1977) and Sandoval County (NMSU, 1978).

Agua Series

The Agua series consists of deep, well-drained soils that formed in recent alluvium on the floodplain along the Rio Grande. Slopes are 0 to 1 percent. Agua soils are mainly associated with Brazito, Gila, and Vinton soils. In a representative profile, the surface layer is light brown loam about 10 inches thick. Next is about 14 inches of brown loam and pink very fine sandy loam. Below this to a depth of 60 inches or more is very pale brown fine sand. The soil is moderately alkaline throughout. Permeability is moderate to a depth of about 24 inches and rapid below.

Agua loam

This level soil is in the irrigated Rio Grande valley. It has the profile described as representative of the series. In most areas the water table is below 60 inches, but in some it fluctuates between 45 and 60 inches. Slopes are 0 to 1 percent. Runoff is very slow and the hazard of erosion is slight.

Agua silty clay loam

This level soil is in the irrigated Rio Grande Valley. It has a profile similar to that described representative of the series, but the surface layer differs in texture. In most areas the water table is below 60 inches, but in some it fluctuates between 45 and 60 inches. Slopes are 0 to 1 percent. Runoff is very slow, and the hazard of erosion is slight.

Gila Series

The Gila series consists of deep, well-drained soils that formed in recent alluvium on the floodplains along the Rio Grande and Rio Puerco. Slopes are 0 to 2 percent. Gila soils are associated with Agua, Anapra, Hantz, Vinton, and Brazito soils. In a representative profile the surface layer is brown loam about 7 inches thick. Next is about 37 inches of stratified brown and light yellowish brown very fine sandy loam and sandy loam. Below this to a depth of 60 inches or more is pale brown sand. The soil is moderately alkaline throughout. Permeability is moderate.

Gila loam
Slopes are 0 to 1 percent. Runoff is slow, and the hazard of water erosion is slight.

Gila clay loam
The surface layer texture is about 10 inches thick. Slopes are 0 to 1 percent. Runoff is slow, and the hazard of water erosion is slight.

Vinton Series
The Vinton series consists of deep, well-drained soils that formed in recent alluvium on the floodplains of the Rio Grande. Slopes are 0 to 3 percent. Vinton soils are associated with Brazito, Bluepoint, Agua, and Gila soils. In a representative profile, the surface layer is brown sandy loam and pinkish gray loamy sand and pinkish gray very fine sand. The soil is moderately alkaline throughout. Permeability is moderately rapid.

Vinton loamy sand
The surface layer is pale brown. In most areas the water table is below 60 inches, but on about 1.5 percent of the acreage it fluctuates between 45 and 60 inches. Slopes are 0 to 1 percent. Runoff is very slow, and the hazard of soil blowing is moderate to severe.

Vinton sandy loam, 0 to 1 percent slopes
In most areas the seasonal water table is below 60 inches, but on about two percent of the acreage it is between depths of 45 and 60 inches and the soil is moderately saline. Runoff is slow, and the hazard of soil blowing is severe.

During construction of the Proposed Action, care would be taken to minimize sediment erosion. Standard BMPs listed in Section 2.1 would be employed. Prior to construction, all environmental protection measures as expressed by contract clauses, design drawings, or other means would be reviewed with the contractor at a pre-construction conference. Silt fence would be installed when working near the bank of the river. All construction activities would be in compliance to all applicable Federal, state and local regulations. Local soil disturbance permits would be required in locations where jetty jack removal and other soil disturbance might take place (see Section 3.8). Initially, there would be minimal to medium levels of soil disturbance. Replanting the areas with native grasses and other vegetation would negate these short-term impacts. Additionally, any disturbed areas would be monitored by several involved agencies to insure stability of these affected areas. Therefore, there would be a temporary short-term adverse effect to soils by the Proposed Action. There would be no change to the existing soil condition under the No Action alternative.

3.2 Climate

The climate in the vicinity of the proposed project is classified as semi-arid. The average maximum temperature is 70ºF and the average minimum temperature is 44ºF. The average annual precipitation is 7.88 inches. Summer is the rainy season. Half of the annual precipitation falls during the period July to October, typically as brief summer rain storms. The snow season in the Albuquerque area generally extends from November to early in April, but snow seldom stays on the ground for more than one day. The average frost-free season at Albuquerque is 190 days, from mid-April to late in October. Relative humidity averages less than 50 percent and generally less than 20 percent on hot sunny afternoons. Winds blow most frequently from the north in winter, and from the south along the river valley in summer. Wind speed averages nearly nine miles per hour for the year.

3.3 Hydrology and Hydraulics

Activities proposed within this project would not raise the Base Flood Elevation (BFE) of the floodway either during or after the project is completed. Since no bank line jetty jacks are proposed for removal, changes to river hydrology are not anticipated. At critical locations revetment (riprap) will be placed on the riverside of the levee to accommodate the Proposed Action. Therefore, there would be no change to hydrology and hydraulics by the Proposed Action.

3.4 Water Quality

There is abundant information on water quality for the Rio Grande bosque in the proposed project locations. Through the efforts of OSD, the University of New Mexico Bosque Ecosystem Monitoring Program (BEMP), New Mexico Natural Heritage Program, U.S. Forest Service Rocky Mountain Research Station, the U.S. Geological Survey, the Corps and others, a vast amount of information on surface and groundwater quality has been collected. The New Mexico Environment Department, Surface Water Quality Bureau, also has some initial water quality information from a sampling period in 2001. During this sampling period, readings of pH, temperature, dissolved oxygen (both in mg/L and percent saturation), electro conductance (EC), and turbidity were taken. Locations throughout the Albuquerque reach have been monitored for at least the past three years and all BEMP sites will continue to be monitored as part of the efforts of this project. Though not anticipated, any changes in water quality would be evaluated.

The Clean Water Act (CWA) provides for the protection of waters and wetlands of the United States from impacts associated with discharges of dredged or fill material in aquatic habitats, including wetlands, as defined under Section 404(b)(1). Since all work associated with the project would be accomplished outside of aquatic areas regulated by this law, a Section 404 permit would not be needed for the work. Because a Section 404 permit is not necessary, neither is a state water quality certification permit needed under Section 401 of the CWA.

Section 402(p) of the CWA regulates point source discharges of pollutants into water of the United States and specifies that storm water discharges associated with construction activity be conducted under National Pollutant Discharge Elimination System (NPDES) guidance. Some ground disturbance may take place. Therefore, an NPDES permit would be required. A Notice

of Intent would be filed, and a Storm Water Pollution Prevention Plan (SWPPP) for the project would be developed by the contractor and be kept on file at the construction site and become part of the permanent project record. The Corps would obtain the NPDES permit prior to commencement of construction activities. Compliance with these requirements would ensure that the Proposed Action would have no significant effect on the water quality of the Rio Grande. Water quality will be monitored throughout the project. Silt fence would be installed prior to construction in all areas. No adverse impact to water quality is anticipated.

3.5 Air Quality and Noise

The proposed project is located in New Mexico's Air Quality Control Region No.152, which encompasses all of Bernalillo County and most of Sandoval and Valencia counties. These three counties are "in attainment" (i.e.: do not exceed State and Federal Environmental Protection Agency air quality standards) for all criteria pollutants (NMED, 1997). Air quality in the project area is generally good. The closest Class I area is Bandelier National Monument, approximately 50 miles to the north of the project area. A Class I area is a wilderness area or a National Park. Air quality in the project area is generally good to excellent due to the lack of urban industrial development. Although high winds are common in and around the project area, blowing dust is generally not a problem except during extremely dry years. Airborne particulate and carbon monoxide concentrations from wood burning in the Rio Grande valley are occasionally high during winter months when temperature inversions and wood stove use are both more prevalent. All vehicles involved in transporting rubble and spoil from the project site to the deposition area would be required to have passed a current New Mexico emissions test and have required emission control equipment (if required).

A fugitive dust permit would be obtained from the City of Albuquerque. All work areas would continually be wet down to minimize dust. All vehicles hauling material would be covered during transport. Therefore, short-term impacts to air quality are anticipated during construction but would be abated to the extent possible using BMPs as described above. There will be no long-term adverse effects to air quality by the Proposed Action.

The OSHA (Occupational Safety and Health Administration) noise standard limits noise levels to 90 dBA averaged over an eight-hour day (29 CFR 1910.95), although hearing damage can begin at levels as low as 80 dBA over an eight-hour day. No worker may be exposed to noise in excess of 115 dBA without protection, which will reduce the exposure below 115 dBA (AFSCME, 2004).

Albuquerque's noise control ordinance was placed into effect in June 1975. The Environmental Health Department's Consumer Protection Division personnel are responsible for enforcing the ordinance. Noise control enforcement may involve many sources of excessive noise: radios, stereos, television, live bands, machinery, equipment fans, air conditioners, construction, vehicle repairs, motor vehicles, and general noise. The ordinance stipulates a property-line value in which the noise level emitted must not exceed 50 decibels (dB) or 10 decibels above the ambient level; whichever is greater (Mitzelfelt, 1996). For example, if you are playing a stereo, the sound level traveling from the stereo to the neighboring property lines cannot be more than 10 decibels higher than the general noise level existing before the stereo was turned on. Noise level meters

are used to measure the sound level as it is crossing the property line. The meters are similar to radar meters the police use for speed detection; however, instead of detecting an object in motion, it detects air pressure (sound waves) in motion and produces a numbered level called decibels.

Equipment to be used during construction would include pieces generating a fair amount of noise. This noise would be somewhat abated in adjacent neighborhoods due to the buffering by the levee road when work is taking place in the bosque. Travel on the levee roads to and from work locations would also create noise during the project. The project would take place during normal work hours between 7:00am and 5:00pm in order to minimize disturbance. All OSHA and local municipality requirements (as described above) would be adhered to. Therefore, there would be minor, short-term noise impacts by the Proposed Action during construction, which would occur only during normal working hours.

3.6 Aesthetics

The overall project goals include reducing fuel loads and thinning of non-native vegetation. Both can be considered unsightly and also create a 'cluttered' bosque. Views into and through the bosque are currently not possible where vast amounts of non-native vegetation and dead material exist piled up on top of each other (Figure 6). Thinning of this vegetation as well as removal of jetty jacks would allow for increase views through the bosque, which would aid in safety as well as increase aesthetics. The 'view' of the bosque would improve for the public using the trail system. Therefore, there would be long-term beneficial effects to aesthetics in the bosque for the public.

FIGURE 6. EXAMPLE OF DEAD AND NON-NATIVE VEGETATION PILED.

3.7 Vegetation Communities

Substantial impacts from human activities, starting about 250 years ago, has resulted in compounding rates of change in structure and vegetation dynamics to the point that the bosque ecosystem is now on the verge of irreversible conversion (Crawford et al., 1996). A similar pattern of loss of alluvial forests through channelization, flow regulation, and levee construction since the 17th century is well documented in Europe (Déscamps et al., 1988). Decline of natural riparian structure and function of the bosque ecosystem was recognized in the 1980s as a major ecological change in the Middle Rio Grande valley (Hink and Ohmart, 1984; Howe and Knopf, 1991).

Loss of conditions necessary for regeneration of native riparian plants and increasing abundance of nonnative species were identified in river systems throughout the western U.S. beginning in the mid-1970s, with main-stem impoundments typically identified as the primary factor driving alteration of ecosystem structure and function (Fenner et al., 1985; Howe and Knopf, 1991). Impoundments alter the hydrograph and reduce sediment supply in downstream reaches and cause channel incision and narrowing of the floodplain (Williams and Wolman, 1984). Installation of jetty jacks, levee construction, sediment and vegetation removal, and irrigation diversions have exacerbated these effects in the project area (Crawford et al., 1993). Changes wrought by impoundments and channel modifications in the project area have created a riparian ecosystem organized by autogenic factors, including plant succession and invasion by nonnative species, and novel allogenic factors such as fire. Conversely, the naturally functioning bosque ecosystem was structured largely by fluvial geomorphic processes (cf. Déscamps et al., 1988).

A major change in vegetation dynamics in the bosque ecosystem has been loss of meander cut-off, meander migration, and flood scour processes, which were a driving force in the dynamics of the naturally functioning system. These processes removed existing vegetation and created new sites for founding of plant communities. Sediment deposition in the project area is now restricted to several, largely ephemeral, mid-channel bars and transitory lateral bars proximal to the river. Meander cut-off and lateral meander migration no longer occur. Bare soil sites are now created primarily through mechanical disturbance or fire, typically in areas no longer subject to periodic inundation and with relatively dry soil moisture regimes.

The frequency and duration of inundation, in addition to moisture requirements for establishment and persistence, also influences the structure of riparian vegetation (Wheeler and Kapp, 1978; Kozlowski, 1984). Riparian plant species vary in their tolerance to inundation and resulting anoxic conditions (Amlin and Rood, 2001). Growth and regeneration of many riparian tree species declines with increasing hydroperiod, and permanent inundation results in eventual loss of tree cover in most riparian ecosystems (Hughes, 1990). Seedlings are particularly sensitive to inundation and tolerance of plants generally increases with age (Jones et al., 1994).

Moisture gradients are a major determinant of the distribution of riparian plant species (Weaver, 1960; Bush and Van Auken, 1984; Tanner, 1986). Soil texture affects moisture regime. Sands drain quickly and, thus, anoxic conditions occur only with high water tables or extended inundation. Fine-particle soils, which are deposited in areas of low current velocity, have high

water-holding capacity and slow drainage. Fine-grained soils may accumulate at arroyo mouths on the floodplain, behind natural levees, and in oxbows (Hughes, 1990).

Soil moisture levels and depth to ground water on floodplain sites are influenced primarily by surface topography, the variation of which is created through fluvial-geomorphic processes (Malanson, 1993). The limits of riparian vegetation are controlled by depth to the water table (Hughes, 1990). Moisture in upper soil layers is a primary influence on establishment of tree species while ground water levels are important for their persistence (Dawson and Ehleringer, 1991). Soil moisture has a major influence on seed germination and seedling survival of cottonwood (Moss, 1938; Bradley and Smith, 1986; Mahoney and Rood, 1993) and willow (Taylor et al., 1999; Dixon, 2003).

Salt cedar is now a prominent colonizer of exposed, bare soil sites in the bosque (Smith et al., 2002). While individual cottonwood seedlings have a greater competitive effect relative to salt cedar seedlings under ideal soil moisture conditions (Sher et al., 2000), the competitive effect is lost under conditions of water stress (Segelquist et al., 1993) or elevated salinity (Busch and Smith, 1995). Salt cedar produces seed for several months beginning in late spring (Ware and Penfound, 1949; Horton et al., 1960) and therefore colonizes bare, moist-soil sites throughout the summer. Cottonwood, on the other hand, produces seed only for a short time in the spring and seed remains viable for only about month and a half under ideal conditions (Horton et al., 1960). The flowering and fruiting phenology of salt cedar allows seedlings to establish on and dominate open sites wetted by runoff, rainfall, or river flows during the summer, precluding the possibility for cottonwood establishment on potentially suitable sites the following spring. Salt cedar also becomes established in the understory of mature cottonwood stands in the project area where there is sufficient light (Crawford et al., 1996).

Russian olive is established by seed in the understory of mature cottonwood stands and also colonizes openings along the river, often forming dense stands (Hink and Ohmart, 1984; Sivinski et al., 1990). Russian olive is also shade tolerant and can survive in areas where cottonwood canopy exists. Seeds germinate in moist to dry sites and the plant sprouts readily from the root crown after damage to or removal of above-ground portions of the plant (Sivinski et al., 1990). Russian olive was present in the understory in 1981 (Hink and Ohmart, 1984) and continues to increase in the bosque in the project area (Sivinski et al., 1990).

Several other nonnative tree species, in addition to salt cedar and Russian olive, are at least locally common, if not abundant, in the overstory. These species are Siberian elm, Tree of Heaven, and Russian mulberry (*Morus alba* var. *tatarica*). All three species are shade-tolerant and readily colonize disturbed sites (Crawford et al., 1996; Sivinski *et al.*, 1990). Siberian elm was rare in the bosque in 1981 when it was found only at very low densities, ranging from less than 0.5 tree/acre to 3 trees/acre (Hink and Ohmart, 1984). However, Siberian elm had become increasingly abundant by 1990 (Sivinski et al. 1990) and is now very common in the overstory. This species produces large seed crops and is ubiquitous in the project area as seedlings, saplings, and mature trees. It sprouts readily from the root crown. Siberian elm seed will germinate under normal rainfall conditions and does not require moist or saturated soils (Sivinski et al., 1990). Tree of Heaven and Russian mulberry are more localized in their distribution in the

project area than salt cedar, Russian olive, or Siberian elm. Both of these species typically colonize disturbed areas, such as along levees and in severely burned sites (Sivinski et al., 1990).

Fire was virtually unknown in naturally functioning, low-elevation riparian ecosystems of the Southwest (Busch and Smith, 1993; Stuever, 1997). However, fuel accumulations coupled with mainly human-caused ignitions have introduced fire as a major disturbance mechanism in the bosque ecosystem (Stuever, 1997). While cottonwood is highly susceptible to fire-induced mortality (Stuever, 1997), salt cedar re-sprouts vigorously following fire (Busch and Smith, 1993; Busch, 1995). Cottonwood and willow (*Salix* spp.) are poorly adapted to fire and lack an efficient post-fire re-sprouting mechanism such as that found in salt cedar (Busch and Smith, 1993).

Post-fire soils have significantly higher salinity than soils of unburned areas, which may suppress growth of cottonwood and willow seedlings and allow establishment of salt cedar seedlings (Busch and Smith, 1993). Salt cedar has a higher salinity tolerance than willow and cottonwood and adjusts to high salinity sites through accumulation of salts and osmotic adjustment, whereas willow and cottonwood exclude ions at the root endodermis (Busch and Smith, 1995). Salt cedar uses the absorbed ions to maintain turgor pressure at low water potential and also exudes salts through special glands, allowing it to tolerate higher salinities and water stress than cottonwood and willow (Busch and Smith, 1995). Halophytes, such as salt cedar, may salinize soils when well-supplied with moisture to reduce water uptake and transpiration (Busch and Smith, 1995).

Vegetation Conditions in 2003

The following description of vegetation in the project area uses plant community designations developed by Hink and Ohmart (1984) and draft mapping performed by the Corps, BOR, and New Mexico Interstate Stream Commission in 2002-2003. Hink and Ohmart (1984) defined six vegetation structural types based on vertical foliage density. Structure Type I consists of tall trees (ca. 60 ft) with a relatively dense understory of saplings and shrubs. Type II structure is also composed of tall trees but with little or no sapling and shrub understory. Type III structure consists of mid-size trees (less than 40 ft) and dense understory vegetation. Type IV structure is characterized by open stands of mid-sized trees with widely scattered shrubs. Type V structure is dense shrubs and saplings to about 15 feet in height. Type VI structure is woody growth with foliage not exceeding about 5 feet in height above the ground.

The Atrisco and Montaño fires in June 2003 involved 253 acres of Type I stands with dense Russian olive and salt cedar in the understory. Only about 10 acres of Type II stands were burned.

Following the 2003 fires, Type I and II stands were still prevalent in the project area (Table 3). These consist of mature, closed canopy stands dominated by Rio Grande cottonwood (*Populus deltoides* var. *wislizenii*) and also containing Siberian elm. Nonnative plants were dominant in the understory of Type I stands throughout the project area. Most of the Type I stands, including those recently converted to Type II stands by fire prevention clearing, had a Russian olive-dominated understory; salt cedar was the second most common understory shrub species. Other

nonnative trees found in the project area as minor components of the vegetation were Russian mulberry, Tree of Heaven, and black locust (*Robinia pseudo-acacia*).

Although typically not as abundant as nonnative species, native shrubs and trees were also found in the understory of Type I stands. Goodding's willow (*Salix gooddingii*) and New Mexico olive (*Forestiera neomexicana*) were found scattered throughout the project area in Type I stands. These species were locally common, often at well-lighted sites in canopy gaps and along the edges of closed-canopy stands. Golden currant (*Ribes aureum*) was also locally common in dense patches. Virginia creeper (*Parthenocissus inserta*) was common throughout the understory and false indigo bush (*Amorpha fruticosa*) was found scattered throughout the understory of Type I stands.

Type III and V areas, or mid-succession stage vegetation, covered about 22% of the project area in 2003. These were saplings of tree species or riparian shrubs, primarily Russian olive.

Table 3. Vegetation types in the Project Areas.

Vegetation type	Hink and Ohmart vegetation type	Following Atrisco and Montaño Fires (June 2003)		Expected following fire hazard reduction and other treatments (Sep. 2004)		Following proposed treatment and restoration	
		Acres	%	Acres	%	Acres	%
Cottonwoods with shrub understory	Type I	1671	42	973	24	1010	25
Cottonwoods with little or no understory	Types II & IV	931	23	1891	47	1011	25
Shrub community	Types III & V	869	22	582	14	1213	30
Grassland and short shrubs	Types VI & OP	477	12	518	13	646	16
Marsh and pond	MH & OW	78	2	78	2	161	4
Totals *		4026		4042		4042	100

* Acreage estimates are from various sources, and, therefore, are approximate.

Current Conditions

Since the fires that took place in June 2003, the City of Albuquerque has initiated an extensive thinning project in order to prevent fires in the Albuquerque area. Unfortunately, two fires have occurred in 2004 -- one between Rio Bravo and Interstate-25 (I-25) on both sides of the river burning approximately 63 acres and the other south of Bridge Blvd. on the east side of the river, burning approximately 18 acres. Prior to these recent fires and in between them, the City has been thinning most areas within the RGVSP. To date, approximately 2,000 of the 3,000 bosque acres in the RGVSP have been 'treated' in some way by the City, Ciudad SWCD and others. Some areas were lightly thinned while other areas were cleared of all non-native vegetation and dead material, depending on the level of fuel reduction required for the site. Clearing activities have greatly reduced the acreage of Type I, III, and V woodlands (Table 3). Recently-created Type II stands are largely devoid of understory vegetation. However, Russian olive and salt cedar have begun sprouting from the root crowns of cut trees in treated stands.

Within the Corrales bosque, some fires and thinning have occurred (approximately 20 acres) over the last few years but the remaining acreage (approximately 570 acres) is largely untreated. Within Sandia Pueblo, numerous thinning projects and one fire have occurred. Approximately 142 acres have been thinned or burned leaving another 548 acres untreated.

Proposed Future Conditions

For the proposed future conditions, revegetation of areas that the City has already worked in will be a primary objective. Revegetation of areas proposed to be thinned under this project would also be revegetated in a timely manner. Current discussions among professionals of riparian restoration include a conceptual mosaic for future vegetative conditions. The prescription for bosque landscape alteration centers on re-creating a patchy mosaic of native riparian trees and open spaces along the narrow active floodplain of the Middle Rio Grande (Crawford and Grogan, 2004). Although the present straightened and levee-bordered river will require that the mosaic be somewhat linear, it will otherwise resemble the pattern of scattered cottonwood groves interspersed by open spaces that once characterized the wider historic floodplain (Horgan 1984). Open areas between the patches also would support grasses and shrubs, and widely spaced individual trees or groves useful for animals moving between the patchy woodlands. This combination of tree reduction (which is already occurring and is being proposed within this project) and increased open space will reduce overall evapotranspiration (ET) in the altered landscape and potentially increase water in its shallow aquifer. The conceptual mosaic is still evolving and will be site specific but an overall breakdown of vegetative communities would include approximately 30% shrub community, approximately 50% tree community (with 25% being tree with grass understory and the other 25% being tree with shrub understory), 16% grassland/herbaceous community, and the other 4% as wet meadow/wetland community (Table 3). Burned areas being revegetated first will be analyzed by land managers to determine how this mosaic community is establishing and refine that as needed for other locations.

Revegetation Strategy

In creating this future conceptual mosaic, revegetation strategies would be implemented. All sites would be tested for depth to groundwater, soil salinity, and soil texture. Existing topography would be coupled with this information to develop revegetation strategies for each project area.

Individual locations within the proposed project may have a varied revegetation strategy in order to aim toward the conceptual mosaic and stay within current water demands. Replacing dead material and non-native vegetation with a mosaic of native vegetation should lead to a system of less water use, decreased fire danger, and increased diversity of native species for use by wildlife. Therefore, the long-term affects of replacing the non-native dominated vegetation system with native dominated species is proposed to outweigh the short-term negative effects, which would be caused by the Proposed Action.

3.8 Floodplains and Wetlands

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is at or near the surface or the land is covered by shallow water (Cowardin et al. 1979). Saturation with water determines the nature of soil development and, in turn, types of plant and animals

inhabiting these areas. Wetlands occurring within the riparian zone may be dominated by the same plant species common in bosque; however, wetlands exhibit wetter soils and support many additional plant and animal species.

Historically, the Rio Grande channel wandered widely throughout the floodplain and abandoned channels often contained sufficient groundwater discharge to support marshes (cienegas), sloughs (esteros), and oxbow lakes (charcos; Scurlock 1998, Ackerly 1999). Currently, the extent of wetland plant communities within the project area reach has been significantly reduced. The groundwater elevation throughout the valley was significantly lowered by the construction of drains in the 1930s. Wetland areas throughout the floodplain have been directly displaced by agricultural and urban development. Irrigation and flood control operations have reduced the magnitude of discharges within the floodway -- especially during the spring runoff period -- and limit the extent of overbank flooding.

Jurisdictional wetlands (relative to Section 404 of the Clean water Act) do occur in the project area. Most wetlands within the floodway have developed in areas with a high groundwater table. Those in shallow basins or relatively far from the river are likely seasonally or temporarily flooded; that is, inundated during the majority, or just a portion, of the growing season, respectively. Within the Rio Grande floodway, most islands, point bars and side channels are periodically inundated by river flows and support marsh, meadow or shrub wetland communities.

Abandoned channels or depressions deep enough to intersect the regional ground water table often support permanently or semi-permanently flooded ponds and marshes. The San Antonio Oxbow is an example of this type within the project area, and is one of the largest wetland complexes in the Middle Rio Grande valley. This wetland's water regime is influenced by shallow groundwater, and surface water from the Rio Grande, San Antonio Arroyo, and the riverside drain.

These wetland communities would be avoided during implementation of the Proposed Action. Where possible, wet meadow areas would be created during the revegetation phase, which would increase the wetland acreage in the project area.

Executive Order 11990 (Protection of Wetlands) requires the avoidance, to the extent possible, of long- and short-term adverse impacts associated with the destruction, modification, or other disturbances of wetland habitats. Wetlands within the project area would be left undisturbed and protected; therefore, the Proposed Action would not effect wetland communities in the project area.

Executive Order 11988 (Floodplain Management) provides Federal guidance for activities within the floodplains of inland and coastal waters. Preservation of the natural values of floodplains is of critical importance to the nation and the State of New Mexico. Federal agencies are required to “ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management.” Removal of the non-native vegetation may allow the floodplain to expand. Since bank line jetty jacks are to remain in place any major changes to the floodplain

would most likely not occur. Therefore, the Proposed Action may affect the floodplain, but these impacts are anticipated to be positive and not significant.

3.9 Fish and Wildlife

An estimated 775 species of fauna (invertebrates and vertebrates including arthropods) may occur in aquatic, wetland, or riparian habitat in Bernalillo County, based on a query of the Biota Information System of New Mexico (BISON version 1/00). Within Sandoval County, over 750 species of fauna occur (also in BISON 2000). This estimate includes 29 species of fish in each county, over 10 amphibian taxa in each county, 39 species of reptiles in Bernalillo County and 42 species of reptiles in Sandoval County, over 250 species of birds in each county, and 54 mammalian taxa in Bernalillo County and 88 mammalian taxa in Sandoval County. Birds are the most important group, based on number of taxa, comprising approximately 70% of all vertebrate species in the estimate.

Common fish species in the project area include river carpsucker (*Carpiodes carpio*), flathead chub (*Platygobio gracilis*), mosquitofish (*Gambusia affinis*), and red shiner (*Cyprinella lutrensis*; Platania, 1993). Less common fish species in the project area include longnose dace (*Rhinichthys cataractae*), channel catfish (*Ictalurus punctatus*), fathead minnow (*Pimephales promelas*), white sucker (*Catostomus commersoni*), and the federally listed Rio Grande silvery minnow (*Hybognathus amarus*).

Of the 18 reptile and amphibian species found in the bosque ecosystem during pitfall trapping, Hink and Ohmart (1984) found only three to be widespread and common. These species were eastern fence lizard (*Sceloporus undulatus*), New Mexico whiptail (*Cnemidophorus neomexicanus*), and Woodhouse's toad (*Bufo woodhousii*). Herptile abundance and diversity was found to be greatest in habitats that lacked dense canopy cover and that were characterized by sandy soils and sparse ground cover (Hink and Ohmart, 1984). Many of the species taken in the bosque were representative of drier upland habitats. Also, sampling methods did not adequately represent aquatic or wetland-associated species. Hink and Ohmart (1984) did describe a distinct assemblage of species associated with denser vegetation cover in wetter habitats, which included tiger salamander (*Ambystoma tigrinum*), western chorus frog (*Pseudocris triseriata*), bullfrog (*Rana catesbeiana*), northern leopard frog (*Rana pipiens*), Great Plains skink (*Eumeces obsoletus*), New Mexico garter snake (*Thamnophis sirtalis dorsalis*), western painted turtle (*Chrysemys picta bellii*), and spiny softshell turtle (*Trionyx spiniferus*).

Common small mammals in the project area are white-footed mouse (*Peromyscus leucopus*), western harvest mouse (*Reithrodontomys megalotis*), house mouse (*Mus musculus*), tawny-bellied cotton rat (*Sigmodon fulviventer*), and rock squirrel (*Spermophilus variegatus*; Hink and Ohmart, 1984; Campbell et al., 1997). Small mammals were found to be more abundant in moister, densely vegetated habitats and those with dense coyote willow than at drier sites (Hink and Ohmart, 1984). Hink and Ohmart (1984) described assemblages of small mammals associated with different habitat types. Crawford's desert shrew (*Notiosorex crawfordi crawfordi*) and white-footed mouse were associated with moist forest and woodland habitats. Well-vegetated, grassy habitats and emergent wetlands were occupied by western harvest mouse, plains harvest mouse, house mouse, tawny-bellied cotton rat, and New Mexican jumping mouse

(*Zapus hudsonius luteus*). Deer mouse (*Peromyscus maniculatus*) was associated mainly with dry cottonwood forest habitat. Open salt cedar habitat had four small mammal species typically found in dry upland habitats: silky pocket mouse (*Perognathus flavus*), Ord's kangaroo rat (*Dipodomys ordii*), Merriam's kangaroo rat (*Dipodomys merriami*), and northern grasshopper mouse (*Onchomys leucogaster*). Large mammals found in the project area include beaver (*Castor canadensis*), raccoon (*Procyon lotor*), muskrat (*Ondatra zibethinus*) in aquatic and wetland habitats, and porcupine (*Erethizon dorsatum*), long-tailed weasel (*Mustela frenata*), striped skunk (*Mephitis mephitis*), rock squirrel, Botta's pocket gopher (*Thomomys bottae*), coyote (*Canis latrans*), and common gray fox (*Urocyon cinereoargenteus scottii*) in riparian woodlands (Hink and Ohmart, 1984; Campbell et al., 1997).

Hink and Ohmart (1984) recorded 277 species of birds in the bosque ecosystem during their two-year study. Highest bird densities and species diversity were found in edge habitat vegetation with a cottonwood overstory and an understory of Russian olive or coyote willow in structure Types I, III, and IV (Hink and Ohmart, 1984). Emergent marsh and other wetland habitats also had relatively high bird density and species richness. Common species in cottonwood habitats in spring and summer included Mourning Dove (*Zenaida macroura*), Black-chinned Hummingbird (*Archilochus alexandri*), Gambel's Quail (*Callipepla gambelii*), Northern Flicker (*Colaptes auratus*), Ash-throated Flycatcher (*Myiarchus cinerascens*), European Starling (*Sturnus vulgaris*), American Robin (*Turdus migratorius*), Northern Oriole (*Icterus galbula*), Black-headed Grosbeak (*Pheucticus melanocephalus*), Lesser Goldfinch (*Carduelis psaltria*), Rufous-sided Towhee (*Pipilio maculatus*), Blue Grosbeak (*Guiraca caerulea*), Yellow-billed Cuckoo (*Coccyzus americanus*), Lazuli Bunting (*Passerina amoena*), Indigo Bunting (*Passerina cyanea*), and Brown-headed Cowbird (*Molothrus ater*).

Thirteen bird species were found to be limited in distribution to particular habitats during the summer, or breeding season. Nine of these species were associated with aquatic or wetland habitats: Pied-billed Grebe (*Podilymbus podiceps*), Snowy Egret (*Egretta thula*), Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina*), American Coot (*Fulica americana*), Killdeer (*Charadrius vociferus*), Spotted Sandpiper (*Actitis macularia*), Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*), and Black Phoebe (*Sayornis nigricans semiatra*). The other four species were strongly associated with cottonwood forest habitat: Great-horned Owl (*Bubo virginianus*), Hairy Woodpecker (*Picoides villosum*), Lewis's Woodpecker (*Melanerpes lewis*), and Mountain Chickadee (*Poecile gambeli*).

More recent bird sampling in the RGVSP found 62 species in winter and 90 during the breeding season (Stahlecker and Cox, 1997). The 10 most common species in winter 1996-1997 were Dark-eyed Junco (*Junco hyemalis*), American Crow (*Corvus brachyrhynchos*), American Goldfinch (*Carduelis tristis*), White-crowned Sparrow (*Zonotrychia leucophrys*), American Robin, Canada Goose (*Branta canadensis*), Red-winged Blackbird (*Agelaius phoeniceus*), Mallard (*Anas platyrhynchos*), European Starling, and House Finch (*Carpodacus mexicanus*). The ten most common species in the bosque in summer 1997 were Black-chinned Hummingbird, Red-winged Blackbird, Black-headed Grosbeak, Spotted Towhee, Brown-headed Cowbird, Mourning Dove, Bewick's Wren (*Thryomanes bewickii*), Black-capped Chickadee (*Poecile atricapillus*), House Finch, Cliff Swallow (*Hirundo pyrrhonota*), and European Starling

(Stahlecker and Cox, 1997). The greatest number of species and highest bird density in both winter and summer was found in emergent marsh habitat (Stahlecker and Cox, 1997). The most abundant bird species found along the river in winter were Mallard, Canada Goose, and Wood Duck (*Aix sponsa*), which were also found breeding throughout the RGVSP, although in lesser numbers, in summer (Stahlecker and Cox, 1997).

Red-Tailed Hawk (*Buteo jamaicensis*) and Cooper's Hawk (*Accipiter cooperii*) were reported as common raptors along the Rio Grande in winter (Stahlecker and Cox, 1997). Cooper's Hawk and Great-horned Owl also occur as nesting birds in the project area. Cooper's Hawk territories can be found approximately every mile along the bosque in the project area (Hawks Aloft Inc., personal communication).

Generally, the abundance of breeding birds increases with the complexity and density of vegetation structure, which is thought to be related to the increased food, cover, or nest substrate it provides. Along the Rio Grande, the highest breeding densities typically have been found in cottonwood stands with a well developed shrub understory (Type I) and in tall shrub stands (Type V), regardless of whether the shrubs are native or exotic (Hink and Ohmart 1984, Hoffman 1990, Thompson et al, 1994, Stahlecker and Cox 1996). Within this woodland type, avian abundance is approximately four times greater along the riverward and landward edges of the bosque, than in the interior of the stand (Hink and Ohmart 1984). Bosque stands with a sparse understory (Type II) generally support fewer breeding birds. Stands of intermediate age or structure (Types III and IV) vary widely in breeding bird use among the studies conducted (Farley et al. 1994), but, in light of the general lack of natural cottonwood and willow regeneration along the Rio Grande, are important for their potential to develop into mature stands. Salt cedar stands (with or without a cottonwood canopy) have relatively low breeding bird use.

The Rio Grande is a major migratory corridor for songbirds (Yong and Finch 2002), waterfowl, and shorebirds. At various times of the year, riparian areas support the highest bird densities and species numbers in the Middle Rio Grande. Both the river channel and the drains adjacent to the bosque provide habitat for species such as Mallards, Wood Ducks, Great Blue Herons, Snowy Egrets, Green Herons, Belted Kingfishers and Black Phoebes. Agricultural fields and grassy areas with little woody vegetation are important food sources for Sparrows and other songbirds during migration and winter.

The peak nesting season for birds is April through August. The Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712) is the primary legislation in the United States established to conserve migratory birds (USFWS, 2004). The list of the species protected by the MBTA appears in title 50, section 10.13, of the Code of Federal Regulations (50 CFR 10.13). The MBTA prohibits taking, killing, or possessing of migratory birds unless permitted by regulations promulgated by the Secretary of the Interior. The U. S. Fish and Wildlife Service (USFWS) and the Department of Justice are the Federal agencies responsible for administering and enforcing the statute. In order to minimize potential effects on nesting birds in the project area, clearing of live vegetation would only occur between September and April.

Other wildlife such as mammals, amphibians and reptiles will also be displaced during implementation of the Proposed Action. Since the ultimate goal is to revegetate with native species, which will create a healthier ecosystem in the long-term for native wildlife, these short-term effects would be outweighed by the long-term benefits. Therefore, the Proposed Action would have short-term negative affects on wildlife with long-term positive benefits.

3.10 Endangered and Protected Species

Three agencies who have primary responsibility for the conservation of animal and plant species in New Mexico are the USFWS , under authority of the Endangered Species Act of 1973 (as amended); the New Mexico Department of Game and Fish, under the authority of the Wildlife Conservation Act of 1974; and the New Mexico Energy, Mineral and Natural Resources Department, under authority of the New Mexico Endangered Plant Species Act and Rule No. NMFRCD 91-1. Each agency maintains a list of animal and or plant species that have been classified, or are candidates for classification, as endangered or threatened based on present status and potential threat to future survival and recruitment. Forty-six special status species are known from Bernalillo County (Table 4). The seven Threatened and Endangered Species that occur in Sandoval County are also present on this table. Fourteen species that are known to occur in plains mesa grassland in riparian, aquatic, or wetland habitat and whose known distribution includes the project area were considered as potentially occurring in the project area (Table 4). Listing and regulations apply only to non-tribal lands.

Protection from harm, harassment, or destruction of habitat is afforded to species protected under the Federal Endangered Species Act. The New Mexico Wildlife Conservation Act and New Mexico Endangered Plant Species Act protect state-listed species by prohibiting take without a permit from the New Mexico Department of Game and Fish or New Mexico Forestry and Resources Conservation Division.

The general vegetation type that each species is known from is listed in Table 4 in the "Habitat" column. Five of the 14 species with the potential to occur in the project area are listed or candidates for listing under the Federal Endangered Species Act: Rio Grande silvery minnow (*Hybognathus amarus*, endangered); Bald Eagle (*Haliaeetus leucocephalus*, threatened); Whooping Crane (*Grus americana*, endangered); Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*, candidate); and Southwestern Willow Flycatcher (*Empidonax traillii extimus*, endangered).

Of the remaining nine species, four are state-listed: Neotropic Cormorant (*Phalacrocorax brasilianus*, state threatened); Common Black-Hawk (*Buteogallus anthracinus anthracinus*, state threatened); Bell's Vireo (*Vireo bellii*, state threatened); and New Mexican meadow jumping mouse (*Zapus hudsonius luteus*, state threatened). The last five species are Federal or state species of concern: flathead chub (*Platygobio gracilis*); Black Tern (*Chlidonias niger surinamensis*); Yuma myotis (*Myotis yumanensis yumanensis*); occult little brown bat (*Myotis lucifugus occultus*); and Pecos River muskrat (*Ondatra zibethicus ripensis*). A discussion of each of these species and the potential effects from the Proposed Action is below.

Table 4. Special status plant and animal species that occur in Bernalillo and Sandoval Counties.
Note: Species listed in bold have the potential to occur in the project area and will be discussed in detail below.

Common Name	Scientific Name	Status		Habitat
Plants (5)				
Santa Fe milkvetch	*Astragalus feensis*	-	SS	PMG,PJW
La Jolla prairie clover	*Dalea scariosa*	-	SS	CDS,DGR
Sapello Canyon larkspur	*Delphinium sapellonis*	-	SS	MCF
Sandia alumroot	*Heuchera pulchella*	-	SS	MCF/Lime
Plank's catchfly	*Silene plankii*	-	SS	PJW-MCF/Rck
Invertebrates (3)				
slate millipede	*Comanchus chihuanus*	FS	SS	PMG
Socorro mountainsnail	*Oreohelix neomexicana*	-	SS	PJW
Southwestern pearly checkerspot butterfly	*Charidryas acastus sabina*	FS	-	CDS-PJW
Fishes (3)				
Rio Grande chub	*Gila pandora*	-	SS	PMG-MCFAq
Rio Grande silvery minnow	***Hybognathus amarus***	**FE**	**SE**	**CDS-PMG/Aq**
flathead chub	***Platygobio gracilis***	**FS**	**-**	**CDS-MCF/Aq**
Birds (19)				
Neotropic Cormorant	***Phalacrocorax brasilianus***	**FS**	**ST**	**DGR-MCF/Aq**
Bald Eagle	***Haliaeetus leucocephalus***	**FT**	**ST**	**CDS-MCF/Rip**
Northern Goshawk	*Accipiter gentilis*	FS	SS	MCF
Common Black-Hawk	***Buteogallus anthracinus anthracinus***	**FS**	**ST**	**CDS-MCF/Rip**
Ferruginous Hawk	*Buteo regalis*	FS	SS	DGR,PMG
American Peregrine Falcon	*Falco peregrinus anatum*	FS	ST	CDS-MCF/Rck
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	FS	-	CDS-MCF/Rck
Whooping Crane	***Grus americana***	**FE**	**SE**	**CDS-PMG/Rip**
Mountain Plover	*Charadrius montanus*	FPt	SS	DGR,PMG
Black Tern	***Chlidonias niger surinamensis***		**FS**	**SS DGR-MCF/Aq,Wet**
Yellow-Billed Cuckoo	***Coccyzus americanus occidentalis***			**FC -DGR-MCF/Aq,Wet**
Burrowing Owl	*Athene cunicularia hypugaea*	FS	-	CDS-PMG
Mexican Spotted Owl	*Strix occidentalis lucida*	FT	SS	MCF,SCF
White-Eared Hummingbird	*Hylocharis leucotis borealis*	-	ST	PJW-MCF/Rip
Southwestern Willow Flycatcher	***Empidonax traillii extimus***	**FE**	**SE**	**CDS-MCF /Rip,Aq**
Loggerhead Shrike	*Lanius ludovicianus*	FS	SS	CDS-PMG

Table 4 continued

Common Name	Scientific Name	Status	Habitat
Bell's Vireo	***Vireo bellii***	**FS ST**	**CDS-PJW/Rip**
Gray Vireo	*Vireo vicinior*	FS ST	PJW
Baird's Sparrow	*Ammodramus bairdii*	FS ST	DGR,PMG
Mammals (16)			
Western small-footed bat	*Myotis ciliolabrum melanorhinus*	FS	SS PJW-MCF/Rip
Yuma myotis	***Myotis yumanensis yumanensis***	**FS**	**SS DGR-MCF/Rip,Aq**
Occult little brown bat	***Myotis lucifugus occultus***	**FS SS**	**CDS-SCF/Rip,Aq**
Long-legged myotis	*Myotis volans interior*	FS SS	MCF/Aq
Fringed myotis	*Myotis thysanodes thysanodes*	FS	SS DGR-MCF/Rck
Spotted bat	*Euderma maculatum*	FS ST	PJW-MCF/Rip
Townsend's big-eared bat	*Corynorhinus townsendii*	FS SS	CDS-MCF
Big free-tailed bat	*Nyctinomops macrotis*	FS SS	PJW-MCF/Rck
Gunnison's prairie dog	*Cynomys gunnisoni*	- SS	DGR,PMG,SMG
Botta's pocket gopher	*Thomomys bottae connectens*	- SS	PMG-PJW
Pecos River muskrat	***Ondatra zibethicus ripensis***	**FS SS**	**CDS-PJW/Aq**
New Mexican meadow jumping mouse	***Zapus hudsonius luteus***	**FS ST**	**CDS-SCF/Rip**
Red fox	*Vulpes vulpes*	- SS	PJW-TUN
Ringtail	*Bassariscus astutus*	FS ST	PJW-SCF/Rck,Rip
Black-footed ferret	*Mustela nigripes*	FE SS	DGR,PMG
Western spotted skunk	*Spilogale gracilis*	- SS	CDS-MCF

Status is: Federal endangered (**FE**); Federal threatened (**FT**); Federal proposed as threatened (**FPt**) or endangered (**FPe**); Federal candidate (**FC**); Federal species of concern (**FS**); state endangered (**SE**); state threatened (**ST**); and state species of concern (**SS**). The state species of concern category also includes plants that have status pursuant to the New Mexico Natural Heritage Program criteria, as indicated on the New Mexico Rare Plant List.

Habitat is coded as: **TUN** =alpine tundra; **SCF** = subalpine coniferous forest; MCF =Rocky Mountain upper or lower montane coniferous forest; **SMG** = subalpine-montane grassland; **PJW** = piñon-juniper woodland; **MSC** = montane scrub; **PMG** = plains-mesa grassland; **DGR** = desert grassland; **BDS** = Great Basin desert scrub; and **CDS** = Chihuahuan desert scrub. Special habitats are coded as: **Rip** = riparian; **Wet** = wetlands; **Aq** = aquatic; **Rck** = rock outcrops, rocky areas or cliffs; **Sand** = sand dunes or sandy soils; **Lime** = limestone cliffs or terraces.

Southwestern Willow Flycatcher

The Southwestern Willow Flycatcher is found in the U.S. from May until September. It winters in southern Mexico, Central America, and northern South America (Unitt, 1987). In New Mexico, the Southwestern Willow Flycatcher is distributed in nine drainages (Gila, Rio Grande, Rio Chama, Coyote Creek, Nutria Creek, Rio Grande de Ranchos, Zuni, Bluewater Creek, and San Francisco). As of 1996, it was estimated that there were only about 400 Southwestern Willow Flycatchers in New Mexico, representing about 42% of the total population of the subspecies (Finch and Stoleson, 2000). Southwestern Willow Flycatchers occur in riparian habitats along rivers, streams, or other wetlands, where dense growths of willows (*Salix* sp.), *Baccharis*, arrowweed (*Pluchea* sp.) salt cedar or other plants are present, often with a scattered overstory of cottonwood (Unitt 1987; Sogge et al., 1997; Finch and Stoleson, 2000). These riparian communities provide nesting and foraging habitat. Throughout the range of Southwestern Willow Flycatcher, these riparian habitats tend to be rare, widely separated, small and often linear locales, separated by vast expanses of arid lands. The Southwestern Willow Flycatcher is endangered by extensive loss and modification of suitable riparian habitat and other factors, including brood parasitism by the Brown-Headed Cowbird (*Molothrus ater;* Unitt, 1987).

The Southwestern Willow Flycatcher is an obligate riparian species and nests in thickets associated with streams and other wetlands where dense growth of willow, Russian olive, salt cedar, or other shrubs are present. Nests are frequently associated with an overstory of scattered cottonwood. Throughout the Southwestern Willow Flycatcher's range, these riparian habitats are now rare, widely separated, and occur in small and/or linear patches. Southwestern Willow Flycatchers nest in thickets of trees and shrubs approximately 6 to 23 feet in height or taller, with a densely vegetated understory approximately 12 feet or more in height. Surface water or saturated soil is usually present beneath or next to occupied thickets (Phillips et al. 1964; Muiznieks et al. 1994). At some nest sites, surface water may be present early in the breeding season with only damp soil present by late June or early July (Muiznieks et al. 1994; Sferra et al. 1995). Habitats not selected for nesting include narrow (less than 30 feet wide) riparian strips, small willow patches, and stands with low stem density. Suitable habitat adjacent to high gradient streams does not appear to be used for nesting. Areas not utilized for nesting may still be used during migration.

Breeding pairs have been found within the Middle Rio Grande from Elephant Butte Reservoir upstream to the vicinity of Española. Southwestern Willow Flycatchers begin arriving in New Mexico in late May and early June. Breeding activity begins immediately and young may fledge as soon as late June. Late nests and re-nesting attempts may not fledge young until late summer (Sogge and Tibbitts 1992; Sogge et al. 1993).

Occupied and potential Southwestern Willow Flycatcher nesting habitat occurs within the Middle Rio Grande valley. Occupied and potential habitat is primarily composed of riparian shrubs and trees, chiefly Goodding's willow and peachleaf willow, Rio Grande cottonwood, coyote willow, and salt cedar. The nearest known breeding Southwestern Willow Flycatchers from the project area occur along the Rio Grande at Isleta Pueblo.

Willow Flycatcher surveys have been conducted at all project locations in Phases A and B per the protocol listed in "A Southwestern Willow Flycatcher Natural History Summary and Survey Protocol" (Sogge et al., 1997). Surveys were conducted by Blue Earth Ecological Consultants, Inc. and Hawks Aloft Inc. for the Corps of Engineers. During field visits with the USFWS, potential breeding habitat was identified at these locations within the project area. These locations were accepted for the Section 7 consultation process (see Appendix D). Site B11 is within the Corrales Bosque Preserve. Sites D36 and D38 were located near the confluence of Calabacillas Arroyo and the Rio Grande, on the west side of the river just north of the Paseo del Norte bridge. Site B13 was located on the east side of the river just south of the Paseo del Norte bridge. Site D39 was located on the west side of the river south of Montaño bridge. Site D35 was located at the Rio Grande Nature Center. Site B10 was located on the east side of the river between Central Avenue and Bridge Boulevard. Sites B9, D34, and D33 were on the east side of the river between Bridge Boulevard and Rio Bravo. Sites D32, B12, D30 and D31 were located on the east side of the river from Rio Bravo south to I-25. Overall, approximately 350 acres were surveyed within the RGVSP and Corrales Bosque Preserve.

Southwestern Willow Flycatcher (*Empidonax traillii* extimus) was detected at site B10 (the Tingley Bar site) on 27 May 2004. Single individuals responded to the tape play-back at two locations within the site. These locations were approximately 800 feet apart. The first individual was heard and observed singing in a clump of salt cedar (*Tamarix chinensis*) along the river bank. The second individual was heard singing in a dense clump of tall coyote willow (*Salix exigua*) on the river bar, about 150 feet from the edge of the river. It is presumed that these individuals were migrants.

No other Southwestern Willow Flycatchers were detected at any of the other sites on any of the survey dates. Yellow-billed Cuckoo (*Coccyzus americanus*) was not heard or observed at any of the sites during the survey. Brown-headed Cowbirds (*Molothrus ater*) were observed at all of the sites throughout the survey.

Surveys were completed as of July 16. Based on these surveys and other surveys performed in the past within the project areas, it is highly unlikely that nesting Southwestern Willow Flycatcher will occupy the project area during the construction period beginning September 2004. It is very possible that migrants will be detected as they were along the Tingley Bar during this survey period. If nesting Flycatchers are detected on the remaining locations to be worked in under this Proposed Action (Phases C and D) then consultation with USFWS will be reinitiated. Any nesting territories discovered would be avoided. Therefore, the Corps has determined that the proposed work may affect but is not likely to adversely affect, the Southwestern Willow Flycatcher. A request for concurrence with this determination has been transmitted to the USFWS.

Bald Eagle

The Bald Eagle (*Haliaeetus leucocephalus*) is a winter resident along rivers and at reservoirs in the Southwestern United States. This species was listed as federally endangered in 1967 (32 Federal Register 4001) and again in 1978 (43 Federal Register 6233), but recently was reclassified as threatened due to breeding population increases throughout the country (U.S. Fish

and Wildlife Service 1995). The U.S. Fish and Wildlife Service (USFWS) proposed removing the Bald Eagle from the list of endangered and threatened wildlife in July 1999 (USFWS, 1999); however, final delisting of the species has not yet occurred.

In New Mexico the Bald Eagle is a winter migrant from the northern border, and southward to the Gila, lower Rio Grande, middle Pecos, and Canadian valleys. The Middle Rio Grande is a key habitat area that includes winter roost and a concentration area. The Bald Eagle is associated with aquatic ecosystems throughout most of its range. The typical diet of Bald Eagles is fish, with many other types of prey such as waterfowl and small mammals, depending on location, time of year, and population cycles of the prey species (USFWS, 1995). In New Mexico, these birds typically roost in groups in trees at night, usually in protected areas such as canyons (New Mexico Department of Game and Fish, 1988).

The general daily routine for a wintering Bald Eagle is to leave its roost at dawn for its foraging ground, feed until midmorning, perch for most of the midday, and possibly feed again in late afternoon before returning to its roost site (Hawkwatch International, Inc. 1993). Both adult and juvenile birds may be present in and around the Middle Rio Grande between late November and early March.

Summering or breeding Eagles are rare and have only been documented from a few locations. Key habitat areas include winter roost and concentration localities, such as at Navajo Lake, the Chama Valley (Rio Arriba County), Cochiti Lake (Sandoval County), the northeastern lakes (Raton to Las Vegas), the lower Canadian River valley, Sumner Lake, Elephant Butte Lake, Caballo Lake, and the upper Gila Basin (Hubbard, 1985a). Any nesting or summering areas are considered key habitat for the species. Bald Eagles are typically associated with water and riparian habitat. These Eagles night-roost in groups in sheltered, forested habitats, such as canyons (New Mexico Department of Game and Fish, 1988). Suitable foraging habitat is characterized by open expanses of water with abundant prey (*e.g.* waterfowl, fish) and large trees or snags for perch sites.

Bald Eagle may occur in winter along the Rio Grande, particularly in the north and south ends of the RGVSP (Stahlecker and Cox, 1997). Winter roost locations are known from the project area, including areas between Rio Bravo and I-25 on both sides of the river. (Stahlecker and Cox, 1997).

The proposed work would occur during the winter, which is when Bald Eagles may be in or near the project area. In order to minimize the potential for disturbing Bald Eagles utilizing adjacent habitat, the following guidelines would be employed. If a Bald Eagle is present within 0.25 mile of the project area in the morning before activity starts, or arrives during breaks in project activity, the contractor would be required to suspend all activity until the bird leaves of its own volition, or a Corps biologist, in consultation with the USFWS, determines that the potential for harassment is minimal. However, if an eagle arrives once activity is underway, or if an eagle were beyond 0.25 mile of the site, activity would not be interrupted.

Implementation of these measures would preserve undisturbed Bald Eagle use of roost, foraging and perching sites in the riparian area adjacent to the project sites. For these reasons, the Proposed Action may affect but is not likely to adversely affect the Bald Eagle.

Neotropic Cormorant

The Neotropic Cormorant (*Phalacrocorax brasilianus*) occurs from southern New Mexico to southern Louisiana, southward through Central America and parts of the Caribbean region to southern South America. Vagrants occur elsewhere, including further north in the United States (American Ornithology Union, 1983). In New Mexico, the species breeds and is variably resident in the Rio Grande Valley at Elephant Butte and Caballo lakes. It also occurs regularly at Bosque del Apache National Wildlife Refuge (Hubbard, 1978). All of these locations are key habitat areas where the species is known to breed. The species also occurs occasionally as non-breeding individuals in the Rio Grande Valley northward to the Bernalillo area, southward to Las Cruces, and in the Gila Valley. It is a vagrant, non-breeding bird to southern Hidalgo County, near Alamogordo (Otero County), and in the lower Pecos River Valley south of Bitter Lake National Wildlife Refuge (New Mexico Department of Game and Fish, 1988). In New Mexico, Neotropic Cormorants are generally found on larger bodies of water such as reservoirs, where they prey on fish (Hubbard, 1978). They nest near or over water, in vegetation such as snags or trees. Stahlecker and Cox (1997: 25) reported Double-Crested Cormorant (*P. auritus*) in the project area in winter and summer, but no Neotropic Cormorants. Neotropic Cormorant may occur in the project area but are unlikely to breed there due to lack of suitable lacustrine habitat. Therefore, the Proposed Action will not effect the Neotropic Cormorant.

Common Black-Hawk

The Common Black-Hawk (*Buteogallus anthracinus anthracinus*) is known to breed in Southwestern New Mexico, east-central to southeastern Arizona, western Texas, and the lower Rio Grande valley and Gulf of Mexico coast in southeastern Texas (Clark and Wheeler, 1987). Most birds migrate south to winter, although some winter records are reported from southern Arizona and the Gulf coast in Texas. In New Mexico, Common Black-Hawk breeds along the lower elevations of the Gila, San Francisco, and Mimbres rivers (Hubbard and Eley, 1985). The species has also been reported as breeding along the Rio Grande north to Albuquerque (Hundertmark, 1974) and, more recently, from the Hondo Valley in Lincoln County (D. W. Stahlecker, pers. com.).

Common Black-Hawks are a large-bodied raptor with body length of 20-23 inches and a wingspan of 48-50 inches. Body plumage is black, wings are wide, and there is a broad white band across the tail, which is black with a white tip. The tail is short and fan-shaped and there are white spots at the base of the outer primaries. This hawk is closely associated with riparian areas and forages mainly on fish, insects, crayfish, amphibians, and reptiles but occasionally takes small mammals and birds (Clark and Wheeler, 1987; Alsop, 2001). The species typically nests in large cottonwood trees in well-developed riparian woodlands or forests (Millsap, 1981; Schnell, 1979). Nests are constructed of sticks and are typically located in the crotch of a tree, located 15 ft to 100 ft above the ground. One to three eggs are laid and there is a single brood per year. Common Black-Hawk is usually active during the day, when individuals can often be observed soaring (Alsop, 2001).

Common Black-Hawks are sensitive to human disturbance and are declining in North America, with an estimated 250 nesting pairs (Alsop, 2001). It is estimated that up to 80 breeding pairs occur in Southwestern New Mexico (New Mexico Department of Game and Fish, 1996). It is likely loss or fragmentation of large blocks of mature riparian forest habitat has reduced the number of breeding pairs in the state (New Mexico Department of Game and Fish, 1988). Only one occurrence of nesting Common Black-Hawk has been reported from the vicinity of the project area in the last 14 years. That report was from the east side of the Rio Grande south of the Rio Bravo bridge (Stahlecker and Cox, 1997).

Due to the lack of recorded Common Black-Hawks using or nesting in the project area, the Proposed Action would not affect them. Monitoring at the location reported near Rio Bravo would be monitored for occurrence.

Whooping Crane

The Whooping Crane (*Grus americana*)was listed as endangered with critical habitat by the U.S, Fish and Wildlife Service in 1978 (43 FR 20938) due to the destruction of wintering and breeding habitat, hunting, collisions with power lines and fences, specimen collecting and other human disturbance. The bird once ranged over most of North America, but probably never occurred in large numbers. By the 19th century, only a few thousand birds survived. Whooping Cranes were not sighted in New Mexico after 1938 until an experimental reintroduction was initiated in 1975.

The Middle Rio Grande was the wintering area of the experimental Rocky Mountain population. Within the Bosque del Apache National Wildlife Refuge, all areas at or below 4,600 feet in elevation have been designated critical habitat for the whooping crane. This designation includes most of the floodplain including the riverine and riparian zone. During the winter months, Whooping Cranes will use sandbars in the Rio Grande near the refuge and isolated areas outside the refuge for night roosting.

Since there are no longer any birds in the experimental Rocky Mountain Population in the Middle Rio Grande, the proposed work would have no effect on the Whooping Crane.

Black Tern

Black Tern (*Chlidonias niger surinamensis*) occurs irregularly in summer in northern New Mexico, the Rio Grande Valley, and the Pecos Valley. This Tern migrates statewide and is considered rare to fairly common locally. Black Tern occurs most frequently in summer in the San Juan Valley, Jicarilla Apache Indian Reservation, the Middle Rio Grande valley, and at Bitter Lake National Wildlife Refuge (Hubbard, 1978). The species winters along Atlantic and Pacific coasts from Panama south to Peru and Suriname (Erlich et al., 1988). Black Terns breed and forage in vegetated marshes with some areas of open water (Bent, 1964; DeGraaf et al., 1991; Finch, 1992). The species is a colonial nester and typically produces one brood per year. Nest success is often quite low (Erlich et al., 1988). Nests are constructed of dried herbaceous plant material and are located in palustrine emergent wetlands on the ground (Alsop, 2001). Black Terns prey primarily on aquatic invertebrates such as insects, crayfish, and small molluscs

but also may eat small fish. Black Tern is not known from the project area and suitable emergent palustrine wetland habitat is limited. Therefore, the Black Tern would not be affected by the Proposed Action.

Yellow-billed Cuckoo

The breeding range of Yellow-Billed Cuckoo (*Coccyzus americanus occidentalis*) extends from California and northern Utah eastward to Southwestern Quebec and south to Mexico. Yellow-Billed Cuckoo has declined precipitously throughout its range in southern Canada, the United States, and northern Mexico. The number of breeding birds has declined by about 42% in the eastern United States (Elphick et al., 2001: 335). It is nearly extinct west of the Continental Divide, having disappeared from British Columbia in the 1920's, from Washington in the 1930's, from Oregon in the 1940's, and from northern-most California in the 1950's. It is extremely rare in the interior West. Its only remaining western "strongholds" are three small populations in California, scattered populations in Arizona (especially on the San Pedro River) and New Mexico (especially the Gila River), and an unknown number of birds in northern Mexico (Center for Biological Diversity, 2000). The species winters in South America (DeGraaf et al., 1991).

Yellow-Billed Cuckoo nests in dense riparian shrub habitat in stands typically at least 25 acres in size (Elphick et al., 2001). They arrive in New Mexico beginning in late April and early May and nest from late May through August (Howe, 1986). Mature cottonwood forest with well-developed willow understory appear to be important characteristics of habitat for Yellow-Billed Cuckoo (Buffington et al., 1997; Gaines and Laymon, 1984). While willows appear to be a preferred nest tree, the species will also nest in dense salt cedar stands (Howe, 1986). Nests are constructed of sticks and are located in dense foliage. Yellow-Billed Cuckoo may nest up to three times a year, with a clutch size of two to six eggs. They may occasionally parasitize nests of other birds, particularly when food is abundant. Yellow-Billed Cuckoo feeds primarily on caterpillars but will also consume bird eggs, frogs, lizards, berries, and other fruits (Erlich et al., 1988). Yellow-Billed Cuckoo forages primarily in the foliage layer of shrubby and woody vegetation. Populations fluctuate markedly in response to variation in caterpillar abundance. Population declines resulting from loss or disturbance of riparian habitat have been consistently reported in the West (Finch, 1992). The greatest factors affecting the Yellow-Billed Cuckoo have been the invasion of exotic woody plants into Southwest riparian systems and clearing of riparian woodlands for agriculture, fuel, development, and attempts at water conservation (Howe, 1986). Both Hink and Ohmart (1984) and Stahlecker and Cox (1997) reported Yellow-Billed Cuckoo as a nesting bird in the bosque of the Middle Rio Grande. Habitat potentially suitable for nesting of Yellow-Billed Cuckoo is present in the project area, primarily in the form of dense salt cedar stands. Yellow-Billed Cuckoo has been noted to nest late into October (D. Krueper, personal communication). Surveys for nests in potential habitat would occur through October prior to construction. This habitat would be thinned and revegetated during this project, creating native potentially suitable habitat in the future. Therefore, the Proposed Action may affect but is not likely to adversely affect the Yellow-Billed Cuckoo.

Bell's Vireo

Bell's Vireo (*Vireo bellii*) breeds from southern California, the Southwest, and the central Great Plains and the adjacent Midwest southward to northern Mexico. The subspecies *V. b. arizonae*

occurs in parts of the Southwestern United States and Sonora, while the subspecies *V. b. medius* occurs to the east (Oberholser, 1974). In New Mexico the subspecies *V. b. arizonae* summers locally in the lower Gila Valley and in Guadalupe Canyon (Hidalgo County), with occasional birds in the lower San Francisco Valley and at San Simon Cienaga in Hidalgo County (Hubbard, 1985c). *V. b. medius* summers very locally in the lower Rio Grande (and as a vagrant north to Albuquerque) and the lower Pecos valleys. Key habitat areas are all sites at which breeding populations of this species are found, including, in addition to the above, Rocky Arroyo and Rattlesnake Springs in Eddy County. In New Mexico, Bell's Vireo characteristically occurs in dense shrubs or woodland along lowland stream courses, with willows (*Salix* spp), mesquite (*Prosopis* spp.), and seepwillows (*Baccharis glutinosa*) being characteristic plant species (Hubbard, 1985c). These Vireos feed on insects, moving slowly about for the most part, gleaning food from branches and leaves. The bird itself is inconspicuous, but the song draws attention to its presence. The nest is a cup of grasses and other plant parts, slung between twigs or small stems not far above the ground. This is generally the only Vireo breeding along lowland streams, although other species occur there in migration. Gray Vireo (*V. vicinior*) may breed on nearby slopes. Bell's Vireo has not been documented as a breeding bird in the project area and habitat suitable for the species is not found there. Therefore, the Proposed Action would not affect the Bell's Vireo.

Rio Grande silvery minnow

Rio Grande silvery minnow (*Hybognathus amarus*) historically occurred in the Rio Grande drainage in New Mexico and Texas (Lee et al., 1980; Propst, 1999). The species was historically one of the most abundant and widespread fishes in the Rio Grande drainage (Bestgen and Platania, 1991). In New Mexico, historic range of the species included the Rio Chama from Abiquiu to the Rio Grande confluence, the main stem of the Rio Grande from Velarde downstream to the New Mexico-Texas state line, and the Pecos River downstream from Santa Rosa (Sublette et al., 1990). Rio Grande silvery minnow was extirpated from the Rio Grande downstream of the Pecos River by 1961 and Pecos River proper by the mid-1970s. The species was also extirpated from the Rio Grande upstream from Cochiti Dam and downstream from Elephant Butte Reservoir. Currently, Rio Grande silvery minnow is present only in the Rio Grande between Cochiti Reservoir and the upper end of Elephant Butte Reservoir, which represents less than 10% of its historic distribution (Bestgen and Platania, 1991; Propst, 1999). Abundance of Rio Grande silvery minnow has declined markedly from 1994 to the present time and the population has become concentrated in the reach of the Rio Grande between San Acacia Diversion Dam and the headwaters of Elephant Butte Reservoir.

Rio Grande silvery minnow is a pelagic-broadcast spawner, producing nonadhesive, semi-buoyant eggs (Platania and Altenbach, 1998). Spawning is initiated by elevated stream discharge and occurs primarily in the late spring and early summer, when water temperatures are 68°F to 75°F (Propst, 1999). Females may produce three to 18 clutches of eggs, each clutch numbering from 200 to 300 eggs. Eggs develop as they drift downstream and hatching typically occurs about four days after fertilization, being dependant on water temperature. After hatching, larvae continue to drift for another one to three days, after which they move into slow-velocity habitats such as backwaters. Growth to maturation occurs in about two months. Rio Grande silvery minnow typically live only about one year, with less than 10% of the adult population

surviving to up to two years (Platania and Altenbach, 1998; Propst, 1999). Habitat used by adult Rio Grande silvery minnow is characterized by silty to sandy substrate, depths of 8 in to 2.6 ft, and slow to moderate current velocity, 0 ft/sec to 0.98 ft/sec; (Dudley and Platania, 1997). Habitats with slow current velocity and associated cover are used in winter. Rio Grande silvery minnow feeds on algae and detritus (Propst, 1999; USFWS, 1999). Major threats to persistence of Rio Grande silvery minnow include diminution of river flows and dewatering by surface water diversions and dam regulation, modification of aquatic habitats that result in faster current velocities and narrower channels, and introduction of nonnative fishes (U.S. Fish and Wildlife Service, 1999: 1-2). Recovery of Rio Grande silvery minnow requires stabilizing the population in the Middle Rio Grande and reestablishing the species in suitable habitats within its historic range (USFWS, 1999).

Rio Grande silvery minnow occurs in the Rio Grande in the project area, which is also includes designated critical habitat for the species (68 Federal Register 8087: 8135). Fish obtained from recent salvage operations conducted during river drying events and captive propagation have been stocked in the Albuquerque area in an attempt to restore the population in that reach (J. Brooks, personal communication). Releases of captive-reared Rio Grande silvery minnow have been made at Alameda Bridge, which is within the project area.

Within the project, benefits to the Rio Grande silvery minnow would be put in place where possible. Different habitat types as designated to be potentially beneficial to the minnow by the Endangered Species Act Collaborative Group would be implemented when feasible. These include inputs of woody debris into the river (material from thinning could be used for this purpose), and creation of embayments along the bank (where this is feasible depending on width of the bosque and protection of the levee). Locations that may be feasible for inputs of woody debris are the Corrales area and in the south end of the RGVSP between Rio Bravo and I-25.

The proposed work area is within designated Critical Habitat for the Rio Grande silvery minnow. Work would not take place in the channel nor would work result in erosion or other inputs into the river. When work is to occur close to the bank of the river, BMPs would be enforced to prevent erosional inputs into the river. These BMPs would include, but not be limited to, the use of silt fences adjacent to the river bank to prevent erosion to the river, fueling of vehicles would not take place in the bosque, and storage of equipment and vehicles should not occur in the bosque. Where possible, habitat that may potentially benefit the minnow would be constructed. Therefore, the Proposed Action may affect but is not likely to adversely modify designated Critical Habitat of the Rio Grande silvery minnow.

Activities proposed to create habitat potentially suitable for the silvery minnow would be incorporated as mentioned above. Therefore, the proposed action may affect but is not likely to adversely affect the Rio Grande silvery minnow.

Flathead Chub

Flathead chub (*Platygobio gracilis*) occurs in west central North America from the lower Mississippi River and tributaries of the South Canadian River in Oklahoma, north to Lake Winnipeg and Saskatchewan and Mackenzie river drainages in Canada. In New Mexico, the

species is native to the Rio Grande, Pecos, and Canadian drainages including the Dry Cimarron drainage. The status of populations of flathead chub is expanding in the Rio Grande drainage and stable in the Pecos and Canadian (including the Dry Cimarron River) drainages. Flathead chub is found in perennial streams and is associated with main-channel habitats characterized by shifting sand substrates and typically turbid water (Sublette et al., 1990). Flathead chub is abundant in the Rio Grande in the project area (USFWS, 1999). Since no work is proposed to take place within the channel of the Rio Grande, the Flathead chub would not likely be affected by the Proposed Action.

Yuma Myotis

Yuma myotis (*Myotis yumanensis yumanensis)* is typically found in grassland, woodland and riparian habitats from 4,000 to 7,000 feet in elevation. This species is most common in desert areas and is closely associated with open water (Schmidly, 1991). Yuma myotis forages at the water surface. Railroad bridges and buildings are common summer retreats for this bat (Findley et al., 1975). Females give birth to one young each year, which are raised in nursery colonies that roost in buildings, mine tunnels, and under bridges (Schmidly, 1991). Nursery colonies are highly sensitive and are quickly abandoned if disturbed. Yuma myotis diet consists primarily of moths, beetles, and midges (Schmidly, 1991). Yuma myotis may occur in the project area. The species was collected at Corrales and several other locations along the Rio Grande upstream and downstream from the project area (Findley et al., 1975). Since no work would take place in their potential habitat (namely under bridges) but the project may affect food sources, the Proposed Action may affect but is not likely to adversely affect the Yuma myotis.

Occult Little Brown Bat

The occult little brown bat (*Myotis lucifugus occultus)*, like *M. yumanensis*, is a "water" bat in that most specimens have been taken in the vicinity of large permanent water sources such as streams, drainage ditches, or lakes (Findley et al., 1975). Areas where such bodies of water are lacking support these animals only as transients. Vegetation zone seems unimportant in determining their distribution (Findley et al., 1975), although nursery colonies of up to several hundred individuals frequently roost under exfoliating bark of old growth ponderosa pine snags. This species is insectivorous, foraging at the water surface. Occult little brown bats mate in fall and fertilization occurs in spring (Barbour and Davis, 1967; Humphrey and Cope, 1976). Young are born in May or June. As with Yuma myotis, occult little brown bat may occur in the project area. Since no work would take place in their potential habitat (namely under bridges) but the project may affect food sources, the Proposed Action may affect but is not likely to adversely affect the occult little brown bat.

Pecos River Muskrat

Muskrats such as the Pecos River muskrat (*Ondatra zibethicus ripensis)* are found throughout North America wherever there is adequate water and emergent vegetation (Hall, 1981). The historic range of the Pecos River muskrat includes areas within New Mexico and Texas. Muskrats occur in marshes and drainage ditches along the Rio Grande, Pecos, and San Juan rivers. A seemingly isolated colony was reported from tributaries of the upper San José near Grants. In the San Francisco and Gila river drainages, the only records of these animals are skulls found in a cave near Reserve. Muskrats occur all over the state up to 10,000 feet elevation in

mountain lakes (Findley et al., 1975); however, the current distribution of this subspecies is largely unknown. Campbell and others (1997) observed muskrat tracks at an island near Montaño Bridge and at the Rio Bravo Bridge crossing, which is within the project area. Since the Proposed Action would not affect wetland habitat it is unlikely that this species would be disturbed by the project. Therefore, the Proposed Action would not affect the Pecos River muskrat.

New Mexican Jumping Mouse

Meadow jumping mouse (*Zapus* spp.) occurs from Alaska to Labrador southward to British Columbia and the Southwestern United States, Oklahoma, Alabama, and Georgia. The subspecies *Zapus hudsonius luteus* is endemic to New Mexico and Arizona (Hafner *et al.*, 1981). In New Mexico, meadow jumping mouse occurs locally in the San Juan, Jemez, and Sacramento mountains and in the central-northern and the central Rio Grande Valley (Hafner et al., 1981). The species has also been recorded once in the Sangre de Cristo Mountains at Williams Lake in Taos County and near Belên (Morrison, 1988). Key habitat areas include along the Rio Cebolla in the Jemez Mountains, the vicinity of Española, Isleta Marsh in Bernalillo County, Bosque del Apache National Wildlife Refuge, and the Cloudcroft area. The species may also still persist where previously taken, including near El Rito (Rio Arriba County) and Socorro. The species characteristically is found in mesic habitats dominated by rank, herbaceous vegetation. In both the Jemez Mountains and the Rio Grande Valley, Morrison (1985, 1988) found that preferred habitat for the meadow jumping mouse included permanent streams, moderate to high soil moisture, and dense and diverse stream side vegetation consisting of grasses, sedges, and forbs. At Bosque del Apache National Wildlife Refuge, meadow jumping mice were associated with a grass and perennial forb community with at least 65% vegetative cover (Zwank, 1994).

New Mexican jumping mouse was collected by Hink and Ohmart (1984) along the Rio Grande only at Isleta Marsh, which is not within the project area. More recent sampling in the project area failed to find the species there (Campbell et al., 1997). Potentially suitable habitat for New Mexican jumping mouse in the project area is restricted a few small wetlands adjacent to the river. However, because these wetlands are inundated quite frequently, it is unlikely that they could support a population of New Mexican jumping mouse. The Proposed Action would not impact existing wetland habitat. Therefore, the Proposed Action would not affect the New Mexican jumping mouse.

3.11 Cultural Resources

The archeology of the Rio Grande valley in the vicinity of Albuquerque is not completely known due to two factors: (a) a long history of agricultural use on the valley floor, and (b) development of the metropolitan area (most of it on private lands) prior to the existence of cultural resource legislation and a general public concern with historic preservation. Furthermore, historical records emphasize proto-historic and historic settlement in the North valley, between Albuquerque and Bernalillo (Campbell 2001; Sargeant 1985). On the other hand, archaeological work on the West Mesa has contributed a great deal of the information about the regional prehistory (Judge n.d.; Schmader 1991, 1994). Four generally recognized cultural-temporal periods apply in the Albuquerque area: the *Paleoindian*, the *Archaic*, the *Pueblo*, and the *Historic*. With the exception of the latest portion of the Pueblo Period, the first three periods are

known only from archeological data, involve only the New World's aboriginal occupants, and span a time period from ca. 12,000 years ago (BP) to the appearance of European explorers in the 1500s (AD 1539 in New Mexico) (Judge n.d.; Schmader 1991, 1994). The Historic period post-dates European contact and is known from written records as well as from archeological materials.

Briefly, the Paleoindian period (ca. 9500–5000 BC) is identified on the basis of distinctive projectile points and other tools and is thought to have been characterized by a highly mobile adaptation focused on the hunting of large late-Pleistocene fauna such as bison (Judge n.d.). The ensuing Archaic period (5000 BC–AD 500) was characterized by a mobile, hunting and gathering adaptation, which saw an increasing emphasis on the use of a broad spectrum of plant and animal resources, with domesticated plants making a late appearance and shallow pithouse habitations becoming common (Cordell 1979). The subsequent prehistoric Pueblo period in central New Mexico is divided four periods; the Basketmaker III-Pueblo I (AD 400/500–900), Pueblo II (AD 900–1150), Pueblo III (AD 1150–1300), and Pueblo IV periods (Campbell 2001:1). The onset of the Pueblo period was characterized by the dietary reliance on cultigens (principally of corn, beans, and squash), more sedentary settlement patterns and the use of pottery. However, evidence of the three early Pueblo periods is rare from the Rio Grande Valley floodplain. During the Pueblo IV period (AD 1300–1650) settlement expanded onto the valley floor, where the inhabitants of large pueblos and smaller surrounding sites relied on intensive agriculture for their subsistence. The Pueblo IV period ended when Coronado's expedition entered the valley in AD 1540, giving way to the Pueblo V period.

It was not until the middle and late 1600s that substantial numbers of Spanish settled the valley in the project area. At about the time of the Spanish *Entrada*, nomadic Navajos and Apaches also appeared in the region, beginning a long and generally antagonistic relationship with the Pueblos and Spanish. Early Spanish settlements consisted of *ranchos* and *haciendas,* which were located along irrigation ditches or *acequias* and agricultural fields (Wozniak 1987). Over time, Spanish agriculture was increasingly based on irrigation water derived from the Rio Grande and brought to the fields by a system of *acequias* that was begun in the early 1600s but not well-developed until the 1700s. By the late 1700s, much of the valley was under cultivation and defined settlements were well established in the valley. However, few of these settlements' structural features remain intact today, having been destroyed by flooding and subsequent development. Many of the acequias, however, remain on or near their original alignments (Marshall and Marshall 1990). In 1848, the United States annexed New Mexico, which effected changes in the area's population, economy, settlement and culture. Subsistence farming and herding in the valley began to give way to commercial agriculture, with the subsistence crops such as corn and beans being replaced in some fields with feed crops such as alfalfa and sorghum. Although the fertility of Rio Grande Valley soils had long been legendary, 300 years of farming, combined with flooding and a rising water table in places led to a marked decline in agricultural productivity, with the area of arable land having been halved by 1917. In 1928, the Middle Rio Grande Conservancy District was formed to organize and improve flood control, drainage and the patchwork system of acequias that had evolved in the valley (Ackerly 1996:69). Some old ditches were abandoned or remodeled, while new ditches and ground water drains were constructed, with the results that thousands of acres of formerly non-irrigable land were

opened to cultivation. In the early 20th Century, and continuing after World War II, ongoing population increases tied to Albuquerque's development as a regional center led to greater demand for housing. Consequently, agriculture began to give way to increasing residential development, a trend that continues today.

Records Search

A records search of the ARMS database was conducted for each of the Priority Jetty Jack Removal Sites and the Priority Treatment sites. No archaeological sites are located within the boundaries of the priority areas.

Survey Results

The archaeological survey of the priority areas was conducted between June 18, 2004 and June 26, 2004. The cultural survey areas were sequentially, but arbitrarily numbered and include eight Phase A Priority Jetty Jack Removal sites (designated Areas A1, A2, A3, A4, A5, A6, A7, and A8), and five Phase B Priority Treatment Sites (designated Areas B9, B10, B11, B12, and B13). A total of twenty-five Isolated Occurrences (IO), and three water control features were encountered during the survey.

The most common IOs encountered during the survey were abandoned transient camps, which numbered eighteen. Of these, thirteen were abandoned and five were occupied or only recently abandoned. These camps were usually found in the dense undergrowth of "Priority Treatment Sites", near the bridges that cross the Rio Grande. Abandoned camps frequently contained blankets or sleeping bags, clothing, beverage containers, and food wrappers. Active and recently abandoned camps were characterized by shelters constructed of fabric, plastic sheeting, or brush and often-incorporated live brush and jetty jacks as supporting elements. Active camps also tended to include books and periodicals and contain more discarded trash. In particular, Area B9, south of the Barelas Bridge (Bridge Blvd.), contained the most active camps (4). Three camps were constructed entirely of dead wood. One, IO 8, was constructed of large pieces of wood in "lean-to" fashion. In Area B11, IOs 16 and 21 were constructed branches lashed with yarn and filled in with interwoven elements.

Informal trash dumps were also encountered the survey areas. Most of these were of contemporary or relatively recent origin and contained tin cans, aluminum cans, glass bottles, and plastic. These were not recorded. Two dumps were recorded. Isolated Occurrence 23 is located in Area B10, south of the Central Avenue Bridge and across from Tingley Beach. It was previously recorded by Marshall (2003:65) as IO 6 and includes old car bodies used as erosion control devices and concrete blocks. Although much of Area B10 inside the levee has been used as a dump for concrete, IO 23 clearly pre-dates construction of the jetty jacks, so recording was limited to those elements alone. Another informal dump, IO 9, is located in Area B9 south of the Barelas Bridge. It consists of a number of small, discontiguous dumps in area of about 50 m by 50 m. It was included as an IO because some of the materials present may predate jetty jack construction. This is uncertain though because no clearly diagnostic materials were encountered and dense undergrowth and widespread leaf litter obscured much of the site. Moreover, the site was also disturbed by earth moving activities, and the construction of a berm and adjacent

borrow pits. The materials located in this dump include lumber, chicken wire and stucco, ceramic electrical fixtures, furniture, tin cans, tar paper, asphalt shingles, and scrap metal.

The survey encountered four IOs related to water/erosion control in two survey areas. These are IOs 18, 20 and 24 in Area B11 and IO 25 in Area A8. Isolated Occurrence 18 is a single creosote treated post 28" tall and 9" in diameter. A bolt threaded at both ends passed through the post three inches above the ground surface. There were no cables or mesh present, as is the case with the retards commonly found in the area. Its purpose is unknown. Isolated Occurrence 20 consisted of twelve 5-gallon metal cans that had been modified as plant containers. A triangular punch opener had cut holes around and on the bottom of each can to allow water to exit. Each can was also split on two sides, probably to remove the plants contained within them. The cans were located in two concentrations within dense brush near a battery of overgrown jetty jacks. This suggests that the cans were discarded about the time the jetty jacks were constructed. Isolated Occurrence 24 was comprised of two broken concrete construction elements separated by 35 meters. They are located inside the levee near the junction of the Cabezon Channel, the Upper Corrales Ditch, and the Sandoval Channel. These concrete pieces were "L" shaped and appeared to be poured of hand-mixed concrete containing aggregate ranging from pea gravel (5mm) to cobble size (10-15cm). Although no iron or wood elements were present, they appear to be the remains of a single water control gate or an acequia crossing. In Area A8, north of the Montaño Bridge, is IO 25, a segment of an earthen berm. It measured about 594 feet in length and was about 6 feet in height and 6 feet wide and was over built by jetty jacks and the contemporary levee. Consequently, its original dimensions are unknown.

Three water control features were also encountered during the survey. These are Feature 1, located in Area B9, and Features 2 and 3, located in Area B13. Feature 1 is an overgrown drainage ditch with a berm. It originates at a concrete and iron valve built into the levee. It measured about 10 feet wide by about 3.3 feet deep and 561 feet long. There was no siphon evident on or outside the levee. The gate, the channel and the outlet to the river are all overgrown, to different degrees indicating little or no recent use or maintenance. Feature 1 appears to have been replaced by a newer concrete-lined ditch with a siphon emanating from the Riverside Drain, which is located about 1155 feet to the south of Feature 1. For this reason, Feature 1 is included here as an abandoned water control feature.

Feature 2 is a drain that dumps into the river in the northwest corner of Area B13. It begins at a concrete and iron valve in Area C19 near the Paseo del Norte Bridge. It appears to have been the southerly extension of a drain that dumps into the Riverside Drain near the bridge. Upon exiting the levee, the ditch turns to the south and extends for about 1403 feet where it turns back to the Southwest. It then continues to the Southwest for about 1073 feet where its channel enters the river, within Area B13. The channel is about 13 feet wide, about 3-6 feet deep and about 2475 feet long. Although this channel appears to receive some maintenance, its sides and banks are partially overgrown. Because there is no apparent siphon, the channel cannot admit water until the Riverside Drain has nearly exceeded its capacity. It is for this reason that this drain is included here as an abandoned water control feature. Feature 3 is a ditch measuring about 2.5 feet deep by 13 feet wide and 1485 feet long. It appears to be an abandoned Southwesterly extension of Feature 2. Its northern end is roughly aligned with a bend in Feature 2 in a part of

the bosque located north of Area B13. Its outlet is near a sandbar south of Area B13 and is indistinct.

All three features appear to be abandoned remnants of historic acequias or drains, and offer the potential to yield important information concerning the agricultural development of this portion of the Upper Middle Rio Grande Valley. Appropriate methods to extract this information may take the form of examination of historical records and maps of the region.

These three features are thus recommended as eligible for inclusion in the National Register of Historic Places under Criterion "d" of 36CFR60.4. At this time, no traditional cultural properties are known to occur in the project areas. Consultation with Tribes that have concerns in the project area has been initiated. It is anticipated that similar survey findings will result from the Phase C and D cultural resources investigations. Cultural resources that are eligible for listing on the National Register of Historic Places would be avoided during construction activities. Contingent upon no issues resulting from consultation with the New Mexico State Historic Preservation Officer and with Tribes, and based on the information provided in the comprehensive cultural resources report, the Corps is of the opinion that there would be "No Adverse Effect to Historic Properties" by the proposed project. The cultural resources survey reports and documentation of consultation regarding cultural resources is contained in Appendix C.

3.12 Socioeconomic Considerations

Socioeconomic resources include population and economic activity, as reflected by personal income, employment distribution, and unemployment. Some related secondary components, such as housing availability and public services, are not considered in this analysis because the action has no potential to generate measurable changes in populations that would create demand for these resources. Statistics at the county, state, and national level would be used to describe the socioeconomic context. Bernalillo and Sandoval Counties serve as the Region of Influence in which most impacts can be expected to occur, and the state and region serve as regions of comparison. Specific information for recreation in the local area and Region of Influence are relevant and also presented.

The proposed project is in Bernalillo and Sandoval Counties, New Mexico. The population in Bernalillo County was estimated at 573,675 in 2002 (U.S. Census Bureau, 2002). It is approximately 1166 square miles with 477 persons per square mile. It is generally urban in character. Sandoval County is roughly 3709 square miles, with approximately 24.2 persons per square mile. The total population of Sandoval County in 2000 was 89,908 (U.S. Census 2000a). It is generally rural in character and has one minor urban center. The Town of Bernalillo and City of Rio Rancho had populations of 6,611 and 51,765, respectively, in 2000.

In 1999, Bernalillo County had a per capita personal income (PCPI) of $20,790. In 2000, Sandoval County had a PCPI of $22,247. This PCPI ranked 5th in the State of New Mexico, and was 101 percent of the State of New Mexico average, $21,931, and was 75% of the national average, $29,469. The average annual growth rate of PCPI over the past 10 years was 4.7 percent for Sandoval County. The average annual growth rate for the State of New Mexico was 3.9 percent and for the nation was 4.2 percent (U.S. Census Bureau 2001 a,b).

The demographics at the county, state, and national levels are compared in Table 6**.** When compared to the national level, the population of Bernalillo and Sandoval Counties has proportionately more persons of Hispanic background, while less of other minority groups, including Asian and Black. However, racial composition is similar to the State as a whole, with a higher percentage of American Indian and Alaska Native (17.2 percent compared to 10.5 percent for New Mexico). It should be noted that persons of Hispanic or Latino origin might be White or any other race. In addition, roughly 14.4 percent claimed to be of some other race, while only 5.5 percent did so at the national level. When compared to New Mexico, Sandoval County has a lower percentage of Hispanics while Bernalillo County has the same percentage as the State.

Consequently, the populations of Bernalillo and Sandoval Counties are not disproportionately composed of minority groups compared to the region, although there may be specific locations where this is not the case.

Table 5. Profile of Demographic Characteristics, Year 2000

Geographic Area	*Total Population*	*Race (Percent of Total Population)**						
		White	*Black or African American*	*American Indian and Alaska Native*	*Asian*	*Native Hawaiian and Other Pacific Islander*	*Some Other Race*	*Hispanic or Latino (of Any Race)*
U.S.	281,421,906	75.1	12.3	0.9	3.6	0.1	5.5	12.5
New Mexico	1,819,046	69.9	2.3	10.5	1.5	0.2	19.4	42
Sandoval County	89,908	68.1	2.2	17.2	1.5	0.2	14.4	29.4
Bernalillo (County	573,675	70.8	2.8	4.2	1.9	0.1	16.1	42
Bernalillo (Town)	6,611	63.3	1.0	4.6	0.3	0.2	34.3	74.8
Rio Rancho (City)	51,765	82	3.4	3.4	2.1	0.3	13.1	27.7

*Percentages may add to more than 100% because individuals may report more than one race.
Source: U.S. Census 2001a,b.

The percentage of the population in New Mexico living below poverty (19.3 percent) is higher than for the nation (13.3 percent). Similarly, the percent of children living below poverty in New Mexico (27.5 percent) is considerably higher than the nation (19.3 percent). Poverty conditions in Bernalillo County and Sandoval County are somewhat better than the state, with 12.9 percent and 13.9 percent below poverty, respectively. Therefore, both Bernalillo County and Sandoval County, when compared to the state, is not disproportionately low-income (U.S. Census 2000a,b). The Proposed Action would not adversely affect the current socioeconomic conditions of Bernalillo and Sandoval Counties.

3.13 Land Use and Recreational Resources

Land Use

The proposed project area is located in Bernalillo and Sandoval Counties. The area is maintained as a part of the Middle Rio Grande Flood Control Acts of 1948 and 1950 and is termed the Middle Rio Grande Project Facilities. The bosque area within Albuquerque is designated as the Rio Grande Valley State Park through the Park Act of 1983 and is cooperatively managed by the City of Albuquerque OSD and the MRGCD. The bosque within Corrales is designated as the Corrales Bosque Preserve and is cooperatively managed by the Village of Corrales and the Corrales Bosque Commission through an agreement with the MRGCD. Sandia Pueblo lands are managed by the Pueblo. Isleta Pueblo lands are managed by them.

Adjacent to the project area (outside of the levees), farming is still a major land use. Small truck farms grow chile, corn, squash, tomatoes and fruit. Alfalfa is a main crop. Dairies and feedlots are also present. There is limited grazing, which is usually confined to families raising cattle for their own use. The proposed project would have no effect on current uses of water for agriculture, ranching, residential, or other activities in the area. State of New Mexico designated uses and standards applied to the Rio Grande would not be affected by the proposed project.

Farmland that is protected from conversion or other adverse effects under provisions of the Farmland Protection Policy Act (Public Law 97-98) includes lands defined as prime or unique, or that are of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops, as determined by the appropriate state or unit of local government agency or agencies.

The project areas are within the Middle Rio Grande Project Facility boundaries and will not affect adjacent agricultural land use and will not change current land status. Therefore, the Proposed Action would not affect land resources.

Recreational Resources

Within the RGVSP, a paved trail along the east side of the river exists along the levee from Alameda Blvd. south to south of Rio Bravo Blvd. (approximately 18 miles in length, see Figure 7). Trails within the bosque exist on both sides of the river in the RGVSP and are a natural surface (in most cases dirt though in some cases a formalized crusher fine trail has been constructed). Various levels of recreation take place on the paved trail including jogging, bicycling, roller blading and walking. On the natural surface trails (Figure 8) jogging and walking take place but mountain biking and horseback riding are also favorite uses. No motorized vehicles except for maintenance and emergency vehicles are allowed per City of Albuquerque and Bernalillo County ordinances.

FIGURE 7. PASEO DEL BOSQUE (PAVED TRAIL) IN THE RGVSP.

FIGURE 8. EXAMPLE OF NATURAL SURFACE TRAIL IN THE BOSUQE.

In the Corrales Bosque Preserve, a natural surface trail allows limited access capable of navigating a natural surface trail jogging, walking and horseback riding, and bicycling). No motorized vehicles are allowed except for maintenance and emergency vehicles per Village

ordinance. Within the Sandia Pueblo, a formalized trail system does not exist but varying levels of recreation take place on the levee and inside the bosque.

Within the RGVSP, construction activities will temporarily impede recreational activities in the project area being worked in. All work zones will be designated and signed with cautionary information. The paved trail will be kept clean for use by Park visitors as much as possible and all machinery and vehicles will yield to Park users. Inside the bosque, where natural surface trails are present they will be kept intact by revegetating and seeding outside of those areas. The specific trail system inside the bosque will be designated and constructed (if any trail construction work is needed) by the City of Albuquerque OSD.

In the Corrales Bosque Preserve, construction activities will temporarily impede recreational activities where a trail system is present within a project work zone. All work zones will be designated and signed with cautionary information. Machinery and vehicles will yield to Preserve visitors. Inside the bosque, where natural surface trails are present they will be kept intact by revegetating and seeding outside of those areas. The specific trail system inside the bosque will be designated and constructed (if any trail construction work is needed) by the Village of Corrales.

On the Sandia Pueblo, construction activities will temporarily impede recreational activities where a trail system is present within a project work zone. All work zones will be designated and signed with cautionary information. Machinery and vehicles will yield to visitors. Inside the bosque, where natural surface trails are present they will be kept intact by revegetating and seeding outside of those areas. The specific trail system inside the bosque will be designated and constructed (if any trail construction work is needed) by Sandia Pueblo.

All precautions noted above will be taken to notify recreational users of work within the area and to maintain existing facilities. The Corps will work with each local land manager (as designated above) to revegetate areas in order to allow future recreational facilities to be implemented by them.

The Proposed Action will have short-term effects on recreational use but these effects will be temporary. The Proposed Action will improve existing and potential future recreational use by opening areas up.

3.14 Indian Trust Assets

Indian Trust Assets are legal interests in property held in trust by the United States for Indian tribes or individuals. Examples of trust assets include land, minerals, hunting and fishing rights, and water rights. The United States has an Indian Trust Responsibility to protect and maintain rights reserved by or granted to Indian tribes or individuals by treaties, statues, executive orders, and rights further interpreted by the courts. This trust responsibility requires that all Federal agencies take all actions reasonably necessary to protect such trust assets. There would be no affect on Indian Trust Assets by the Proposed Action as all potential projects on Pueblo land are being coordinated with their input and approval.

3.15 Hazardous, toxic and radioactive waste (HTRW)

On June 7 and 8, 2004 staff from the Corps Albuquerque District Geotechnical and HTRW Branch visually inspected the following project locations. No invasive activities such as excavating or soil sampling were performed. Observations for each location are noted.

- **A1 – Jetty Jack Removal Priority Site, South of Alameda on the East Side of the Rio Grande:** Three pieces of concrete rubble were identified at this location. Note that the New Mexico Environment Department regulates clean concrete rubble as a fill material and not a hazardous or solid waste. This rubble will be removed as part of the Proposed Action. No other items were observed. No samples for waste characterization were collected, as none were deemed necessary to this effort.

- **A2 - Jetty Jack Removal Priority Site, Midway Between Paseo del Norte and Alameda on the East Side of the Rio Grande:** No staining or discoloration of the ground was observed at this location. There does not appear to be any solid or hazardous waste present. No samples for waste characterization were collected, as none were deemed necessary to this effort.

- **A3 - Jetty Jack Removal Priority Site, North of Paseo del Norte on the East Side of the Rio Grande:** A large area of concrete rubble was identified at this location. Note that the New Mexico Environment Department regulates clean concrete rubble as a fill material and not a hazardous or solid waste. One piece of asphalt concrete was observed near the concrete rubble. This rubble would be removed from the site and disposed of at an appropriate construction and debris landfill as part of the Proposed Action. No other items were observed. No samples for waste characterization were collected at this time.

- **A4 - Jetty Jack Removal Priority Site, Midway Between Paseo del Norte and Montaño on the East Side of the Rio Grande:** No staining or discoloration of the ground was observed at this location. There does not appear to be any solid or hazardous waste present. No samples for waste characterization were collected, as none were deemed necessary to this effort.

- **A5 - Jetty Jack Removal Priority Site, South of I-40 on the East Side of the Rio Grande:** Three tires were identified at this location. These would be removed from the site and disposed of at an appropriate landfill as part of the Proposed Action. No other items were observed; however, the embankment appears disturbed. No samples for waste characterization were collected, at this time. Prior to any excavation activities, this area should be investigated for buried solid or hazardous wastes.

- **A6 - Jetty Jack Removal Priority Site, South of Bridge Blvd. on the West Side of the Rio Grande:** No staining or discoloration of the ground was observed at this location. There does not appear to be any solid or hazardous waste present. No samples for waste characterization were collected, as none were deemed necessary to this effort.

- **A7 - Jetty Jack Removal Priority Site, South of Bridge Blvd.:** No staining or discoloration of the ground was observed at this location. There does not appear to be any solid or hazardous waste present. No samples for waste characterization were collected, as none were deemed necessary to this effort.

- **B9 - Priority Treatment Site, South of Bridge Blvd.:** Several trash piles were identified at the southern section of this site. These would be removed from the site and disposed of at an appropriate landfill as part of the Proposed Action. No samples for waste characterization were collected, at this time. Following the removal of this solid waste, the site should be reevaluated for ground disturbance and the potential for buried solid or hazardous wastes.

- **B10 - Priority Treatment Site, Central Avenue on the East Side of the Rio Grande (Tingley):** Weathered asphalt and concrete rubble were identified at this location. The asphalt would be removed from the site and disposed of at an appropriate construction and debris landfill as part of the Proposed Action. No other items were observed. No samples for waste characterization were collected at this time.

- **B11 - Priority Treatment Site, North of Alameda on the West Side of the Rio Grande:** A few pieces of concrete rubble were identified at the most northern quarter of the site that would be removed as part of the Proposed Action. No other items were observed. No samples for waste characterization were collected, as none were deemed necessary to this effort.

- **B12 - Priority Treatment Site, North of I-25 on the East Side of the Rio Grande:** No staining or discoloration of the ground was observed at this location. There does not appear to be any solid or hazardous waste present. No samples for waste characterization were collected, as none were deemed necessary to this effort.

- **B13 - Priority Treatment Site, South of Paseo del Norte on the East Side of the Rio Grande:** No staining or discoloration of the ground was observed at this location. There does not appear to be any solid or hazardous waste present. No samples for waste characterization were collected, as none were deemed necessary to this effort.

- **C14 - Jetty Jack Removal Priority Site, South of I-40:** No staining or discoloration of the ground was observed at this location. There does not appear to be any solid or hazardous waste present. No samples for waste characterization were collected, as none were deemed necessary to this effort.

Where noted and otherwise in existence within the project areas, concrete and asphalt and other debris would be removed as part of the Proposed Action. All required permits would be obtained. Removal of this debris in combination with other project actions (jetty jack removal, fuel reduction, etc.) would allow the area to be revegetated with native species. Therefore, the removal of debris as noted above would occur as required and have a positive effect as part as part of the Proposed Action.

3.16 Environmental Justice

The planning and decision-making process for actions proposed by Federal agencies involves a study of other relevant environmental statutes and regulations, including Executive Order (EO12898), *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* which was issued by President Clinton on February 11, 1994. The essential purpose of EO 12898 is to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no groups of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, tribal and local programs and policies. Also included with environmental justice are concerns pursuant to EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks.* This EO directs Federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children under the age of 18. These risks are defined as "risks to health or to safety that are attributable to products or substances that the child is likely to come into contact with or ingest."

Environmental justice considerations addressed in this assessment involve both population demographics, including ethnic, racial, or national origin characteristics, and persons in poverty, including children under age 18. In order to determine whether environmental impacts affect minority or low-income populations, it is necessary to establish a basis of comparison, referred to as the "region of comparison." This area consists of the geopolitical units that include the proposed project. Most environmental effects from the Proposed Action, in this instance, would be expected to occur in Bernalillo and Sandoval Counties, New Mexico.

Executive Order 12898 (Environmental Justice) requires "to the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report of the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations…" The project would not disrupt or displace any residential or commercial structures. The work has been reviewed for compliance with this order and it has been determined that the Proposed Action would not adversely affect the health or environment of minority or low-income populations.

3.17 Noxious Weeds

The Federal Noxious Weed Act of 1974 (Public law 93-269; U.S.C. 2801) provides for the control and eradication of noxious weeds and their regulation in interstate and foreign commerce. Executive Order 13112 directs Federal agencies to prevent the introduction of invasive (exotic) species and provides for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

In addition, the State of New Mexico, under administration of the Unites States Department of Agriculture, designates and lists certain weed species as being noxious (Nellessen 2000). "Noxious" in this context means plants not native to New Mexico that may have a negative impact on the economy or environment, and are targeted for management or control. Class C listed weeds are common, widespread species that are fairly well established within the state. Management and suppression of Class C weeds is at the discretion of the lead agency. Class B weeds are considered common within certain regions of the state but are not widespread. Control objectives for Class B weeds are to prevent new infestations, and in areas where they are already abundant, to contain the infestation and prevent their further spread. Class A weeds have limited distributions within the state. Preventing new infestations and eliminating existing infestations is the priority for Class A weeds.

These guidelines apply to both the removal of salt cedar, which is considered a Class C weed as well as the potential for Class A, B, or C weeds that might establish after thinning of non-native species occurs. It is anticipated that due to efforts to treat resprouts of non-natives and replanting of native species, that this should belay new infestation of weedy species. This would, however, be monitored. Regrowth of all vegetation would be monitored throughout the duration of the project for infestation by noxious weeds and non-native species such as salt cedar and Russian olive. Therefore, it has been determined by the Corps that the Proposed Action is within compliance of the Federal Noxious Weed Act.

3.18 Herbicide Application and the Environmental Fate of Chemicals

Herbicide application would be used after treatment of non-native vegetation where root ripping is not an option.

Arsenal® is a broad-spectrum, nonselective herbicide. This herbicide inhibits the aromatic amino acid biosynthesis pathway and inhibits resprouting by salt cedar. Imazapyr (Arsenal®) in a 28.7% active ingredient formulation is absorbed by roots and foliage of plants and inhibits plant growth by affecting the biosynthetic pathway of aliphatic amino acids (BASF, 2003). Inert ingredients (such as a nonionic surfactant) are applied at a rate of 71.3% (combined with the 28.7% Imazapyr to equal Arsenal®). Arsenal® has been approved by the Environmental Protection Agency (EPA) for application adjacent to waterways. Application areas should be at least 500 feet away from the active floodplain. Applications would occur in early September when herbicides would be quickly transported to meristem tissues and with carbohydrates via phloem tissues to the root system for storage. Herbicide application during this time period would inhibit root resprouting. Milder weather and higher relative humidity encountered during this period also reduces the thickness of salt cedar leaf cuticles allowing easier herbicide penetration.

The propensity for soil leaching is low for Imazapyr. It has a high water solubility and strong soil adsorption characteristics. The soil half-life persistence for Imazapyr is 30-150 days (Tu et al., 2001). Imazapyr is soluble in water but has a low potential for leaching into ground-water (Information Ventures, 1995). Precautions are taken during application to maintain a buffer between the water's edge and the target area. Effects on human health were evaluated by the U.S. Forest Service (USFS) and found no reports of human poisoning or long-term health effects

(Information Ventures, 1995). Exposure levels from contact or consumption were below levels shown to cause harmful effects in laboratory studies.

Based on test results submitted to the EPA by the Monsanto and American Cyanamid companies, this herbicide, when properly applied, should pose minimum risks to representative wildlife species occurring in the area. Using the general toxicity classification scheme designed by the EPA, Arsenal® would be slightly toxic to rodents, non-toxic to slightly toxic to birds, non-toxic to slightly toxic to fish and non-toxic to slightly toxic to arthropods. Studies indicate that Imazapyr is excreted by mammalian systems rapidly with no bioaccumulation (Tu et al., 2001).

For application of Arsenal® in Bernalillo and Sandoval Counties, supplemental labeling for application to salt cedar for the state of New Mexico applies. The New Mexico Department of Agriculture, Pesticide Management Bureau must be notified at least 24 hours prior to any Arsenal® application allowed under this 24(c) registration. The herbicide must not be applied within one (1) mile upstream or 500 feet downstream of drinking water intakes or irrigation water intakes currently in use. Before treating adjacent to any public water bodies, contact the controlling water authority (EPA, 2001).

Garlon® is the commercial version of triclopyr and generally contains one or more inert ingredients. The contents of two triclopyr formulations are: Garlon® 3A: triclopyr (44.4%), and inert ingredients (55.6%) including water, emulsifiers, surfactants, and ethanol (1%); and Garlon ®4: triclopyr (61.6%), and inert ingredients (38.4%) including kerosene. Triclopyr acts by disturbing plant growth. It is absorbed by green bark, leaves and roots and moves throughout the plant. Triclopyr accumulates in the meristem (growth region) of the plant.

For foliar treatment, triclopyr would be applied during active plant growth. Basal bark and cut surface treatments can be done at any time of year. Dormant stem application can only be done when trees and brush are dormant. Triclopyr should be applied only when there is little or no hazard of spray drift. Triclopyr is active in the soil, and is absorbed by plant roots. Microorganisms degrade triclopyr rapidly; the average half-life in soil is 46 days. Triclopyr degrades more rapidly under warm, moist conditions. The potential for leaching depends on the soil type, acidity and rainfall conditions. Triclopyr should not be a leaching problem under normal conditions since it binds to clay and organic matter in soil. Triclopyr may leach from light soils if rainfall is very heavy. Sunlight rapidly breaks down triclopyr in water. The half-life in water is less than 24 hours.

Triclopyr is slightly toxic to practically non-toxic to soil microorganisms. Triclopyr is toxic to many plants. Even very small amounts of spray may injure some plants. The ester form of triclopyr, found in Garlon® 4, is more toxic, but under normal conditions, it rapidly breaks down in water to a less toxic form. Triclopyr is slightly toxic to practically non-toxic to invertebrates. Triclopyr and its formulations have not been tested for chronic effects in aquatic animals. Triclopyr is slightly toxic to mammals. In mammals, most triclopyr is excreted, unchanged, in the urine. Triclopyr and its formulations have very low toxicity to birds. Triclopyr is non-toxic to bees. Triclopyr and its formulations have not been tested for chronic effects in terrestrial animals.

The exposure levels a person could receive from these sources, as a result of routine operations, are below levels shown to cause harmful effects in laboratory studies. Inert ingredients found in triclopyr products may include water, petroleum solvents, kerosene, surfactants, emulsifiers, and methanol. Methanol, kerosene and petroleum solvents may be a toxic hazard if the pesticide is swallowed. Surfactants and emulsifiers are generally low in toxicity. The formulated products are generally less toxic than triclopyr. Garlon® 3A is a skin irritant and a severe eye irritant.

The USFS has evaluated health effects data in the development of both pesticide background statement documents and environmental impact statements for pesticide use on forest lands. These health effects evaluations have taken into consideration the potential for both worker and public exposure from Forest Service operations. This information has been used in assessing health risks and consequently in formulating protective measures to reduce risk to workers and to the public.

It has been found by other agencies in the area currently using these herbicides (MRGCD, OSD and the Bosque del Apache National Wildlife Refuge) that both Garlon® 4 (mixed 25-75% with vegetable oil) or Arsenal® (mixed with Round-Up) have been successful. Differences in application and season can determine which herbicide should be used. Per discussions with USFS personnel (Parker, personal communication) who helped develop Garlon®, the pros and cons of each are as follows:

Garlon®	Arsenal®
Works well in winter	Works better outside of cold weather
Affects only non-native vegetation	Affects all vegetation
Doesn't move as rapidly into the soil	Does move into the soil
Less expensive	More expensive
Public needs to stay out of the area for 48 hours	Public needs to stay out of the area 12 hours
Breaks down in water	Must be at least 500 feet away from water to use

Based on this information and the information described above, either herbicide may be used depending on site-specific conditions. Many of the areas are in high public use areas and Arsenal® may be the preferred agent in those locations. In more remote areas and when adjacency to water is an issue, Garlon® may be used. This will be determined in the field based on the specific site locations. All required permitting and licensure would be obtained by the contractor. Prior to application, all chemicals will be specifically approved per manufacturers instructions.

3.19 Cumulative Effects

NEPA defines cumulative effects as "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." Environmental impacts associated with the bosque in Albuquerque, Corrales, and Sandia Pueblo have been evaluated relative to the Corps' Proposed Action.

Other projects in the region

Construction of Cochiti Dam in 1965 has resulted in the ongoing degradation of the Rio Grande channel and its riparian zone both upstream and downstream of the structure. It is anticipated that the adverse environmental impacts attributed to its placement and traditional operation would continue in the future as long as it is operated for existing purposes and in the present manner. Its impacts to the immediate and surrounding landscape and local terrestrial ecosystem have stabilized since its construction. Therefore, the existing condition of the area above the Highway 22 Bridge can be considered the baseline against which impacts of the Proposed Action have been compared.

Currently, the Corps, BOR, and the New Mexico Interstate Stream Commission are signatories of the Memorandum of Agreement to conduct the Upper Rio Grande Water Operations Review and prepare a Programmatic Water Operations Environmental Impact Statement. That study is being prepared by the parties in accordance with NEPA and will present alternatives for analyzing water operations at federally operated facilities in the Upper Rio Grande Basin and will evaluate the environmental, economic, and social effects of these alternatives. It is not anticipated that the proposed project would add cumulatively to the environmental effects of any of the water operations alternatives that may be considered and/or adopted by the water operations review.

The Middle Rio Grande Endangered Species Act Collaborative Program is a multi-agency organization that has funded a number of habitat restoration projects in the project area. It is anticipated there would be no cumulative impact considered in these projects.

The Corps is involved in two 1135 Ecosystem Restoration projects within the RGVSP between I-40 and Bridge Blvd. The Albuquerque Biological Park and Wetland Restoration Project south of Central Avenue will go to construction this fall. The Ecosystem Restoration at Route 66 project, which is the bosque in the area between I-40 and Bridge Blvd. is currently in planning stages. The Proposed Action would not conflict with the plans for these projects and enhancements from all projects will benefit one another.

Proposed Action Effects

Prior to the Atrisco and Montaño fires in 2003, approximately 2800 acres of shrub habitat (Hink and Ohmart Types I, II, and V) occurred within the project area. These structural types generally support a high density of breeding birds and small mammals.

Over the past two years, approximately 1250 acres of these types have burnt or been physically removed or thinned for research, ecosystem restoration, or fire prevention purposes. Under the Corps' proposed plan, non-native shrubs would be removed from an additional 850 acres of the remaining 1500 acres. The remnant, untreated 650 acres represents about 23% of the pre-fire area of Types I, III, and V. The additional clearing of shrub habitats would be a significant adverse effect but for the extensive revegetation activities in the proposed plan. As described in Sections 2.1 and 3.8, native shrubs and trees would be replanted throughout approximately 1375 acres, including areas proposed to be treated by the Corps, as well as areas recently cleared by

the City of Albuquerque and Sandia Pueblo. Following the maturation of planted vegetation, the Corps estimates that approximately 2200 acres of native-dominated shrub habitat would result (Table 3). While revegetation eventually avoids a significant adverse effect of the proposed action, there would remain a short-term adverse effect of wildlife populations until planted shrub communities mature. It is estimated that a minimum of 10 years will be required for planted shrubs to be achieve stature and densities resembling existing conditions.

In summary, it is proposed that this project would have a positive impact on the environment resulting from the potential cumulative effects of other Federal and non-Federal agencies.

4.0 Conclusion

4.1 Summary of Effects

Table 6. Summary of Effects

Existing Environment	**Foreseeable Effects**
Physiography, Geology, Soils	Short-term adverse effect on soils
Hydrology and Hydraulics	No effect
Water Quality	No effect
Air Quality and Noise	Negligible, short-term adverse effects
Aesthetics	Short-term negative effects with long-term positive effects
Vegetation Communities	Short-term negative effects with long-term positive effects
Floodplains and Wetlands	No effect
Wildlife	Short-term negative effects with long-term positive effects
Endangered and Protected Species	May affect but not likely to adversely effect: Southwester Willow Flycatcher, Bald Eagle, Yellow-Billed Cuckoo, Rio Grande silvery minnow, Rio Grande silvery minnow critical habitat, Yuma myotis, Occult little brown bat; No effect to: Neotropic Cormorant, Common Black-Hawk, Whooping Crane, Black Tern, Bell's Vireo, Flathead chub, Pecos River muskrat, New Mexico jumping mouse
Cultural Resources	No adverse effect to Historic Properties
Socioeconomic Considerations	No adverse effect
Land Use and Recreational Resources	Short-term negative effects with long-term positive effects
Indian Trust Assets	No adverse effect
Environmental Justice	No adverse effect

The summary of effects above includes some short-term adverse effects that will result in long-term benefits. These benefits are described in the next section as well as throughout the text.

4.2 Project Benefits

Benefits of Fuel Reduction, Removing Non-native Species, and Revegetation with Native Species

Long-term benefits proposed by the project include reduction in fire potential, potential water savings, potential decreased soil salinity, and increased wildlife habitat value over the long-term.

Fuel loads in the Middle Rio Grande have built up over the last 50 years or more due to the lack of flooding and disconnect between the river and bosque. Flood flows used to carry away debris and allow for quicker processing of vegetative material. Since this does not readily occur, much of the dead material has built up over that period of time and created an extreme fire danger. A reduction in these fuel loads, especially in the ladder fuels (which create a ladder between the floor of the bosque and the cottonwood canopy), can greatly reduce the chance of a catastrophic fire were one to occur. This older material is also extremely dry and flammable. Removal and processing of this material is crucial to preventing future fires.

Numerous studies have documented that salt cedar uses more water than native riparian species. In the Middle Rio Grande, dense stands of salt cedar have been shown to have higher evapotranspiration (ET) rates than a mature cottonwood stand with a closed canopy (a more typical native riparian habitat) (Dahm et al., 2002). A number of projects and research efforts throughout the Southwest state that salt cedar use more water than native Southwestern vegetation; therefore a potential water gain may be realized as a result of salt cedar removal.

It is estimated that the average annual water loss due to ET in the Middle Rio Grande riparian corridor is 20-50% of that reach's total water depletion (Dahm et al. 2002). Bosque ET appears to be higher in dense stands of salt cedar, and in mature stands of cottonwood containing extensive understories of salt cedar and Russian olive, than it is in less dense salt cedar stands and mature cottonwood stands with few understory trees (Dahm et al. 2002). Thus reduction of tree densities, especially those of invasive species occurring either in monospecific stands or in the subcanopies of mature cottonwood stands, is basic to an increased potential water quantity. This 'balance' for revegetation with native species is greatly needed during this time of natural drought conditions.

Salt cedar are fire-adapted species and have long tap roots that allow them to intercept deep water tables and interfere with natural aquatic systems. Salt cedar disrupts the structure and stability of native plant communities and degrades native wildlife habitat by out-competing and replacing native plant species, monopolizing limited sources of moisture, and increasing the frequency, intensity and effect of fires and floods. Although it provides some shelter, the foliage and flowers of salt cedar provide little food value for native wildlife species that depend on nutrient-rich native plant resources (Muzika and Swearingen, 1999). Birds prefer to nest in native vegetation that contain their preferred physical structure and food source. Overall, the possible short term ill effects resulting from salt cedar control and the proposed action should be strongly mitigated through the replacement of salt cedar with a younger, more diverse native riparian community which would add to biodiversity at the landscape level.

Salt cedar control in mixed salt cedar/native bosque would reduce stress to native species, which are competing with exotic vegetation, and would reduce wildfire hazards (Taylor, 1999). Substrate for native species regeneration within these sites would also be provided as a result of salt cedar control and decreased salinity of the soil. This alternative would maximize the production of indigenous species such as salt grass, willow, and native wet meadow species, to potentially support greater numbers of native bird species and other wildlife.

Removal of all of the non-native species where present within the project area would also decrease the number of seed sources that affect areas downstream and other native plant communities on the Rio Grande.

As discussed above, the removal of non-native vegetation may potentially yield water savings to the river system. Monitoring of groundwater levels is being conducted throughout the Middle Rio Grande and if changes were to occur they could be tracked. Whether or not there would be an increase in water quantity is a question that would be studied throughout this project and others of its type. The Proposed Action will greatly decrease the fire hazard also by thinning non-natives as well as dead material.

Benefits by Access Improvement

Levee road improvement, drain crossing construction, jetty jack removal, and dry hydrant installation will increase access into the bosque to allow for maintenance of a low fire hazard level and increase options to fight a fire if one were to occur.

Overall, the project would aid in wildfire prevention and restoration in the Middle Rio Grande bosque in the Rio Grande Valley State Park, Corrales Bosque Preserve, Sandia Pueblo and Isleta Pueblo. Work would be directed toward those portions of the bosque, which have been damaged by wildfire or are in imminent danger of damage from wildfire due to heavy fuel loads and impediments to emergency vehicle access as shown in Figures 3a-3c. These benefits would meet the overall goals of the project as stated in the authority in Section 1.1.

5.0 Preparation, Consultation, and Coordination

5.1 Preparers

Fritz Blake - Project Manager
Ondrea Hummel - Biologist
William DeRagon – Biologist
Gregory Everhart – Archaeologist
Steve Boberg - Hydrologist
Cecilia Horner – Environmental Engineer

5.2 Consultation and Coordination

Agencies and other entities contacted formally or informally in preparation of this EA include:

U.S. Fish and Wildlife Service
City of Albuquerque
Middle Rio Grande Conservancy District
New Mexico State Forestry Division
New Mexico State Highway Department
Sandia Pueblo
Isleta Pueblo
Village of Corrales
Corrales Bosque Commission
Bernalillo County
New Mexico Department of Game and Fish
New Mexico Department of Agriculture, Bureau of Pesticide Management
New Mexico Environment Department
New Mexico State Historic Preservation Officer
Hopi Tribe
Laguna Pueblo
Navajo Nation
White Mountain Apache Tribe
Ysleta del Sur Pueblo
Cochiti Pueblo
Comanche National of Oklahoma
Jemez Pueblo
Jicarilla Apache Nation
San Felipe Pueblo
San Ildefonso Pueblo
Santa Ana Pueblo
Santa Clara Pueblo
Santo Domingo Pueblo
Zia Pueblo

6.0 References

Ackerly, N. W. 1996. *A review of the Historic Significance of and Management Recommendations for Preserving New Mexico's Acequia Systems.* Dos Rios Consultants. Silver City, New Mexico.

Ackerly, N.W. 1999. The evolution of the Rio Grande. Pages 26-32 in Proceedings, 43rd Annual New Mexico Water Conference: Water Challenges on the Lower Rio Grande. New Mexico Water Resources Institute Report No. 310. Las Cruces, NM.

Agee, J. K. 1988. Successional dynamics in forest riparian zones. Pages 31-43 *in:* Raedeke, K. J. (ed.). *Streamside Management: Riparian Wildlife and Forestry Interactions*. Institute of Forest Resources Contribution No. 59, University of Washington, Seattle, Washington.

Allen, R. P. 1952. *The Whooping Crane*. National Audubon Society Research Report 3.

Allen, J. R. L. 1965. A review of the origin and characteristics of recent alluvial sediments. *Sedimentology* 5: 89-191.

Alsop, F. J. III. 2001. *Birds of North America, Western Region*. DK Publishing, New York, New York.

American Federation of State, County, Municipal Employees (AFSCME). Noise Fact Sheet. http://www.afscme.org/health/faq-nois.htm#standard.

American Ornithology Union. 1983. *Check-list of North American Birds*. American Ornithology Union, Lawrence, Kansas.

Amlin, N. A. and S. B. Rood. 2001. Inundation tolerance of riparian willows and cottonwoods. *Journal of the American Water Resources Association* 37: 1709-1720.

Austin, M. P. 1987. Models for the analysis of species' response to environmental gradients. *Vegetatio* 69: 33-45.

Baker, W. L. and G. M. Walford. 1995. Multiple stable states and models of riparian vegetation succession on the Animas River, Colorado. *Annals of the Association of American Geographers* 85: 320-338.

Barbour, R. W. and W. H Davis. 1967. *Bats of America*. University Press, Lexington, Kentucky.

BASF Corporation. 2003. Material Safety Data Sheet for Arsenal Herbicide. Product # 579605.

Bent, A. C. 1964. Life histories of North American flycatchers, larks, swallows, and their allies. *U.S. Nature Museum Bulletin* 179.

Bestgen, K. R. and S. P. Platania. 1991. Status and conservation of the Rio Grande silvery minnow, *Hybognathus amarus*. *The Southwestern Naturalist* 36: 225-232.

Bradley, C. and D. Smith. 1986. Plains cottonwood recruitment and survival on a prairie meandering river floodplain, Milk River, southern Alberta and northern Montana. *Canadian Journal of Botany* 64: 1433-1442.

Brady, W., D. R. Patton, and J. Paxson. 1985. The development of Southwestern riparian gallery forests. Pages 39-43 *in*: Johnson, R. R., C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre (eds.). *Riparian Ecosystems and Their Management: Reconciling Conflicting Uses*. U.S. Forest Service General Technical Report RM-120.

Brinson, M. M., B. L. Swift, R. C. Plantico, and J. S. Barclay. 1981. *Riparian Ecosystems: Their Ecology and Status*. FWS/OBS-81/17. Biological Services Program, Fish and Wildlife Service, U.S. Department of the Interior.

Buffington, J. M., J. C. Kilgo, R. A. Sargent, K. V. Miller, and B. R. Chapman. 1997. Comparison of breeding bird communities in bottomland hardwood forests of different successional stages. *Wilson Bulletin* 109: 314-319.

Bullard, T. F. and S. G. Wells. 1992. *Hydrology of the Middle Rio Grande from Velarde to Elephant Butte Reservoir*. Resource Publication 179, U.S. Fish and Wildlife Service.

Busch, D. E. 1995. Effects of fire on Southwestern riparian plant community structure. *The Southwestern Naturalist* 40: 259-267.

Busch, D. E. and S. D. Smith. 1993. Effects of fire on water and salinity relations of riparian woodland taxa. *Oecologia* 94: 186-194.

Busch, D. E. and S. D. Smith. 1995. Mechanisms associated with decline of woody species in riparian ecosystems of the Southwestern U.S. *Ecological Monographs* 65: 347-370.

Bush, J. K. and O. W. Van Auken. 1984. Woody-species composition of the upper San Antonio River gallery forest. *Texas Journal of Science* 36: 139-148.

Campbell, Kirstin J. 2001 *Cultural Resources of the Rio Grande Valley, New Mexico*. *Background Information for the Rio Grande Valley Utilities Project, Bernalillo County, New Mexico*. Report No. 164. Parsons Brinkerhoff Archaeology Group, Albuquerque.

Campbell, M. L., J. N. Stuart, and J. B. M. Miyashiro. 1997. *A Survey of Mammal Populations in the Rio Grande Valley State Park, Albuquerque, New Mexico: 1996-97.* City of Albuquerque Open Space Division, Albuquerque.

Center for Biological Diversity. 2000. The yellow-billed cuckoo (*Coccyzus americanus*). http://www.biologicaldiversity.org/swcbd/species/cuckoo/cuckoo1.html

Clark, W. S. And B. K. Wheeler. 1987. *Hawks of North America*. Houghton Mifflin Company, Boston, Massachusetts.

Cowardin, L., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Biological Service Program FWS/OBS-79/31. 45 pages + plates.

Crawford, C. S., A. C. Cully, R. Leutheuser, M. S. Sifuentes, L. H. White, and J. P. Wilber. 1993. *Middle Rio Grande Ecosystem: Bosque Biological Management Plan*. Middle Rio Grande Biological Interagency Team, U.S. Fish and Wildlife Service, Albuquerque, New Mexico. xxiv+291 pp., 4 maps.

Crawford, C. S., L. M. Ellis, and M. C. Molles, Jr. 1996. The Middle Rio Grande bosque: an endangered ecosystem. *New Mexico Journal of Science* 36: 276-299.

Crawford, C. and S. Grogan. 2004. Bosque landscape alteration will reduce fires and conserve water: a proposal.

Cordell, Linda S. 1979 *A Cultural Overview of the Middle Rio Grande Valley, New Mexico.* USDA Forest Service, Albuquerque, and USDI, Bureau of Land Management, Santa Fe.

Dahm, C.N., J.R. Cleverly, J.E. Allred Coonrod, J.R. Thibault, D.E. McDonnell, and D.J. Gilroy. 2002. *Freshwater Biology* 47:831-843.

Dawson, T. E. and J. R. Ehleringer. 1991. Streamside trees that do not use stream water. *Nature* 350: 335-337.

DeGraaf, R. M., V. E. Scott, R. H. Hamre, L. Ernst, and S. H. Anderson. 1991. *Forest and Rangeland Birds of the United States, Natural History and Habitat Use*. U.S. Department of Agriculture, Forest Service, Agriculture Handbook 688.

Déscamps, H., M. Fortuné, F. Gazelle, and G. Pautou. 1988. Historical influence of man on the riparian dynamics of a fluvial landscape. *Landscape Ecology* 1: 163-173.

Dixon, M. D. 2003. Effects of flow pattern on riparian seedling recruitment on sandbars in the Wisconsin River, Wisconsin, USA. *Wetlands* 23: 125-139.

Dudley, R. K. And S. P. Platania. 1997. *Habitat Use of Rio Grande Silvery Minnow*. Report to the New Mexico Department of Game and Fish, Santa Fe, and the U.S. Bureau of Reclamation, Albuquerque, New Mexico.

Durkin, P., E. Muldavin, M. Bradley, and S. E. Carr. 1995. A preliminary riparian/wetland vegetation community classification of the Upper and Middle Rio Grande watersheds in New Mexico. Pages 44-61 *in*: Shaw, D. W. and D. M. Finch (tech. coords.). *Desired*

Future Conditions for Southwestern Riparian Ecosystems: Bringing Interests and Concerns Together. U.S. Department of Agriculture, Forest Service, General Technical Report RM-GTR-272.

Ellis, L. M., M. C. Molles, Jr., and C. S. Crawford. 1999. Influence of experimental flooding on litter dynamics in a Rio Grande riparian forest, New Mexico. *Restoration Ecology* 7: 193-204.

Elphick, C., J. B. Dunning, Jr., and D. A. Sibley (eds.). 2001. *The Sibley Guide to Bird Life and Behavior*. Alfred A. Knopf, New York, New York.

Erlich, P. R., D. S. Dobkin, and D. Wheye. 1988. *The Birder's Handbook, A Field Guide to the Natural History of North American Birds*. Fireside Book Published by Simon and Schuster, New York, New York.

Energy, Minerals and Natural Resources Department (EMNRD). No date (n.d.). A technical guide for dry hydrants. Prepared for: New Mexico State Resource Conservation and Development Council, HUB, and El Llano Estacado Resources Conservation and Development Councils.

Environmental Protection Agency (EPA). 2001. Arsenal Supplemental Labeling. EPA Reg. No. 241-346. EPA SLN No. NM-02001. For distribution and use only in the New Mexico Counties of San Miguel, Guadalupe, DeBaca, Chaves, Eddy, Taos, Rio Arriba, Santa Fe, Sandoval, Bernalillo, Valencia, Socorro, Sierra and Dona Ana. Only for application to salt cedar (*Tamarix spp.)* for the purpose of water conservation and riparian and wildlife habitat restoration.

Fenner, P., W. W. Brady, and D. R. Patton. 1985. Effects of regulated water flows on regeneration of Fremont cottonwood. *Journal of Range Management* 38: 135-138.

Finch, D. M. 1992. *Threatened, Endangered, and Vulnerable Species of Terrestrial Vertebrates in the Rocky Mountain Region*. U.S. Department of Agriculture, Forest Service, General Technical Report RM-215.

Finch, D. M. and S. H. Stoleson (eds.). 2000. *Status, Ecology, and Conservation of the Southwestern Willow Flycatcher*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-60.

Findley, J. S., A. H. Harris, D. E. Wilson, and C. Jones. 1975. *Mammals of New Mexico*. University of New Mexico Press, Albuquerque, New Mexico.

Gaines, D. And S. A. Laymon. 1984. Decline, status, and preservation of yellow-billed cuckoo in California. *Western Birds* 15: 49-80.

Gleason, H. A. 1926. The individualistic concept of the plant association. *Bulletin of the Torrey Botanical Club* 53: 7-26.

Hafner, D. J., K. E. Petersen, and T. L. Yates. 1981. Evolutionary relationships of jumping mice (genus *Zapus*) of the Southwestern United States. *Journal of Mammalogy* 62: 501-512.

Hall, E. R. 1981. *The Mammals of North America*. John Wiley & Sons, New York, New York.

Harris, R. R. 1987. Occurrence patterns of vegetation on geomorphic surfaces in the active floodplain of a California alluvial stream. *American Midland Naturalist* 118: 393-405.

Hawkwatch International, Inc. 1993. Bald Eagle behavior.

Hefley, H. M. 1937. Ecological studies on the Canadian River floodplain in Cleveland County, Oklahoma. *Ecological Monographs* 7: 140-148.

Hink, V.C., and R.D. Ohmart. 1984. *Middle Rio Grande Biological Survey*. U.S. Army Corps of Engineers, Albuquerque District, New Mexico. Contract No. DACW47-81-C-0015, Arizona State University. 193 pp.

Hoffman , S.W. 1990. *Bosque Biological Monitoring Program: Bird Population Surveys in Rio Grande Valley State Park (1987-1990)*. Prepared for City of Albuquerque, Open Space Division. 53 pp.

Horgan, P. 1984. *Great River: the Rio Grande in North American History*. Wesleyan University Press, Hanover.

Horton, J. S., F. C. Mounts, and J. M. Kraft. 1960. *Seed Germination and Seedling Establishment of Phreatophyte Species*. Rocky Mountain Forest and Range Experiment Station Paper No. 48, U.S. Forest Service, Fort Collins, Colorado.

Howe, W. H. 1986. *Status of the Yellow-Billed Cuckoo (Coccyzus americanus) in New Mexico*. New Mexico Department of Game and Fish, Santa Fe, New Mexico.

Howe, W. H. and F. L. Knopf. 1991. On the imminent decline of Rio Grande cottonwoods in central New Mexico. *The Southwestern Naturalist* 36: 218-224.

Hubbard, J. P. 1978. *Revised Check-list of the Birds of New Mexico*. New Mexico Ornithological Society Publication 6.

Hubbard, J. P. 1985a. *Bald Eagle* (*Haliaeetus leucocephalus*). New Mexico Department of Game and Fish, Handbook of Species Endangered in New Mexico: BIRD/AC/HA/LE: 1-2. New Mexico Department of Game and Fish, Santa Fe, New Mexico.

Hubbard, J. P. 1985b. *Whooping Crane* (*Grus americana*). New Mexico Department of Game and Fish, Handbook of Species Endangered in New Mexico: BIRD/GR/GR/AM: 1-2. New Mexico Department of Game and Fish, Santa Fe, New Mexico.

Hubbard, J. P. 1985c. *Bell's Vireo* (*Vireo bellii*). New Mexico Department of Game and Fish, Handbook of Species Endangered in New Mexico: BIRD/VI/VI/BE: 1-2. New Mexico Department of Game and Fish, Santa Fe, New Mexico.

Hubbard, J. P. and J. W. Eley. 1985. *Common Black-Hawk* (*Buteogallus anthracinus anthracinus*). New Mexico Department of Game and Fish, Handbook of Species Endangered in New Mexico: BIRD/AC/BG/AN: 1-2. New Mexico Department of Game and Fish, Santa Fe, New Mexico.

Hubbard, J. P., W. H. Baltosser, and C. G. Schmitt. 1986. Mid-winter aerial surveys of bald Eagles in New Mexico. *In*: Glinski, R. L., B. Giron Pendleton, M. B. Moss, M. N. LeFranc, Jr., B. A. Millsap and S. W. Hoffman (eds.). *Proceedings of the Southwestern Raptor Management Symposium and Workshop*. National Wildlife Federation Scientific and Technical Series 11: 289-293.

Hughes, F. M. R. 1990. The influence of flooding regimes on forest distribution and composition in the Tana River floodplain, Kenya. *Journal of Applied Ecology* 27: 475-491.

Humphrey, S. R. and J. B Cope. 1976. *Population Ecology of the Little Brown Bat, Myotis lucifugus, in Indiana and North-Central Kentucky*. American Society of Mammalogists, Special Publication No. 4.

Hundertmark, C. A. 1974. Breeding range extensions of certain birds in New Mexico. *Wilson Bulletin* 86: 298-300.

Information Ventures, Inc. 1995. Imazapyr, pesticide fact sheet. Prepared for the U.S. Department of Agriculture, Forest Service. http://Infoventures.com

Jackson, J. R. and I. E. Lindauer. 1978. Vegetation of the flood plain of the South Platte River in the proposed Narrows Reservoir site. *Transactions, Missouri Academy of Science* 12: 37-46.

Johnson, W. C., R. L. Burgess, and W. R. Keammerer. 1976. Forest overstory vegetation on the Missouri River floodplain in North Dakota. *Ecological Monographs* 45: 59-84.

Jones, R. H., R. R. Sharitz, P. M. Dixon, D. S. Segal, and R. L. Schneider. 1994. Woody plant regeneration in four floodplain forests. *Ecological Monographs* 64: 345-367.

Judge, William J. n.d. Early Man; Plains and Southwest: An Interpretive Summary of the PaleoIndian Occupation of the Plains and Southwest. Manuscript submitted to the *Handbook of the North Americans*, Vol. 3. Edited by William C. Sturtevant. Smithsonian Institution, Washington, D.C.

Karrenberg, S., P. J. Edwards, and J. Kollmann. 2002. The life history of Salicaceae living in the active zone of floodplains. *Freshwater Biology* 47: 733-748.

Kozlowski, T. T. 1984. Plant responses to flooding of soil. *BioScience* 31: 162-167.

Kupfer, J. A. and G. P. Malanson. 1992. Observed and modeled directional change in riparian forest composition at a cutbank edge. *Landscape Ecology* 8: 185-199.

Lagasse, P. F. 1981. Geomorphic response of the Rio Grande to dam construction. Pages 27-46 *in*: Wells, S. G. and W. Lambert (eds.). *Environmental Geology and Hydrology in New Mexico*. New Mexico Geological Society Special Publication 10.

Lee, D. S., C. R. Gilbert, C. H. Hocutt, R. E. Jenkins, D. E. McAllister, and J. R. Stauffer. 1980. *Atlas of North American Freshwater Fishes*. Publication #1980-12 of the North Carolina Biological Survey, North Carolina State Museum of Natural History.

Leopold, L. B., M. G. Wolman, and J. P. Miller. 1964. *Fluvial Processes in Geomorphology*. Dover Publications, Inc., New York. xiii+522 pp.

Mahoney, J. M. and S. B. Rood. 1993. A model for assessing the effects of altered river flows on the recruitment of riparian cottonwoods. Pages 228-232 *in*: Tellman, B., H. J. Cortner, M. G. Wallace, L. F. DeBano, and R. H. Hamre (tech. coords.). *Riparian Management: Common Threads and Shared Interests*. U.S. Forest Service General Technical Report RM-226.

Malanson, G. P. 1993. *Riparian Landscapes*. Cambridge Studies in Ecology, Cambridge University Press, Great Britain. x+296 pp.

Marshall, Michael P. 2003. *A Cultural Resources Survey for the Proposed Middle Rio Grande Bosque Restoration Project, Bernalillo County, New Mexico*. Cibola Research Consultants Report No. 345. Corrales, New Mexico.

Marshall, Michael P. and Christina Marshall. 1990 *The 1989-1990 Middle Rio Grande Acequia Archaeological Survey Project*. Complete Archaeological Services Associates. Cortez, Colorado.

Milford, E., E. Muldavin, and T. Neville. 2003. *Middle Rio Grande River Bar Map: the Albuquerque Reach*. New Mexico Natural Heritage Program Report 03-GTR-244.

Millsap, B. A. 1981. *Distributional Status of Falconiformes in West-central Arizona, with Notes on Ecology, Reproductive Success, and Management*. U.S. Department of the Interior, Bureau of Land Management, Technical Note 355.

Mitzelfelt, R. 1996. Albuquerque's Environmental Story. Environmental Topic: Noise. http://www.cabq.gov/aes/s5noise.html

Morrison, J. L. 1985. *The Distribution of the Meadow Jumping Mouse, Zapus hudsonius luteus, in the Jemez Mountains, New Mexico*. New Mexico Department of Game and Fish, Contract 516.6-74-01, Final Report:1-39.

Morrison, J. L. 1988. *Distribution, Life History, and Ecology of the Meadow Jumping Mouse, Zapus hudsonius luteus, at Four Sites Along the Rio Grande Valley in New Mexico*. New Mexico Department of Game and Fish, Contract 516.6-75-21, Final Report:1-57.

Moss, E. H. 1938. Longevity of seed and establishment of seedlings in species of *Populus*. *Botanical Gazette* 99: 529-547.

Muzika, R. and J. M. Swearingen. 1999. Salt cedar. Written for Plant Conservation Alliance: Alien Plant Working Group. U.S. Forest Service and U. S. National Park Service. http://www.nps.gov/plants/alien/fact/tama1.htm

Muiznieks, B., S. Sferra, T. Corman, M. Sogge, and T. Tibbitts. 1994. Arizona partners in flight Southwestern Willow Flycatcher survey, 1993. Draft technical report: nongame and endangered wildlife program, Arizona Game and Fish Department, Phoenix, Arizona. April 1994. 28 pp.

Nellessen, Jim. 2000. New Mexico State Highway and Transportation Department Environmental Section. Noxious Weed Management Guidelines. 9 pp

New Mexico Department of Game and Fish. 1988. *Handbook of Species Endangered in New Mexico*. New Mexico Department of Game and Fish, Santa Fe, New Mexico.

New Mexico Department of Game and Fish. 1996. *Threatened and Endangered Species of New Mexico, Biennial Review and Recommendations*. New Mexico Department of Game and Fish, Santa Fe, New Mexico.

New Mexico Environment Department. 1997. New Mexico Air Quality. State of New Mexico Air Quality Bureau. Santa Fe.

New Mexico State University (NMSU), Agricultural Experiment Station. 1978. Soils of New Mexico. Research Report 285.

Noble, M. G. 1979. The origin of *Populus deltoides* and *Salix interior* zones on point bars along the Minnesota River. *American Midland Naturalist* 102: 59-67.

Oberholser, H. C. 1974. *The Bird Life of Texas, Volume 2*. University of Texas Press, Austin, Texas.

Platania, S. P. 1993. *The Fishes of the Rio Grande Between Velarde and Elephant Butte Reservoir and Their Habitat Associations.* U.S. Bureau of Reclamation, Albuquerque.

Platania, S. P. And C. S. Altenbach. 1998. Reproductive strategies and egg types of seven Rio Grande basin cyprinids. *Copeia* 3:559-569.

Poff, N. L., J. D. Allan, M. B. Bain, J. R. Karr, K. L. Prestegaard, B. D. Richter, R. E. Sparks, and J. C. Stromberg. 1997. The natural flow regime: a paradigm for river conservation and restoration. *BioScience* 47: 769-784.

Propst, D. L. 1999. *Threatened and Endangered Fishes of New Mexico*. Technical Report 1, New Mexico Department of Game and Fish, Santa Fe, New Mexico.

Richter, B. D. and H. E. Richter. 2000. Prescribing flood regimes to sustain riparian ecosystems along meandering rivers. *Conservation Biology* 14: 1467-1478.

Rejmánek, M. 1977. The concept of structure in phytosociology with references to classification of plant communities. *Vegetatio* 35: 55-61.

Rosgen, D. L. 1996. *Applied River Morphology*. Wildland Hydrology, Pagosa Springs, Colorado.

Sargeant, Kathryn. 1985. *An Archaeological and Historical Survey of the Village of Los Ranchos*. New Mexico Historic Preservation Division. Santa Fe.

Schmader, Matthew F. 1991 *At the River's Edge: Early Puebloan Settlement in the Middle Rio Grande Valley, New Mexico*. Submitted by Rio Grande Consultants, Inc. Albuquerque.

1994. *Early Puebloan Site Structure and Technological Organization in the Middle Rio Grande Valley, New Mexico*. Unpublished Ph.D. dissertation, Department of Anthropology, University of New Mexico, Albuquerque.

Schmidly, D. L. 1991. *The Bats of Texas*. Texas A&M University Press, College Station, Texas.

Schnell, J. H. 1979. *Habitat Management Series for Unique or Endangered Species, Report No. 18, Black Hawk (Buteogallus anthracinus)*. U.S. Department of the Interior, Bureau of Land Management, Technical Note 329.

Schumm, S. A. and D. F. Meyer. 1979. Morphology of alluvial rivers of the Great Plains. *Great Plains Agricultural Council* 91: 9-14.

Scott, M. L., J. M. Friedman, and G. T. Auble. 1996. Fluvial process and the establishment of bottomland trees. *Geomorphology* 14: 327-339.

Scurlock, D. 1998. *From the Rio to the Sierra: An Environmental History of the Middle Rio Grande Basin*. U.S. Forest Service General Technical Report RMRS-GTR-5.

Segelquist, C. A., M. L. Scott, and G.T. Auble. 1993. Establishment of *Populus deltoides* under simulated alluvial groundwater declines. *American Midland Naturalist* 130: 274-285.

Shankman, D. 1993. Channel migration and vegetation patterns in the southeastern coastal plain. *Conservation Biology* 7: 176-183.

Sher, A. A., D. L. Marshall, and S. A. Gilbert. 2000. Competition between native *Populus deltoides* and invasive *Tamarix ramosissima* and the implications for re-establishing flooding disturbance. *Conservation Biology* 14: 1744-1754.

Shull, C. A. 1922. The formation of a new island in the Mississippi River. *Ecology* 3: 202-206.

Sivinski, R., G. Fitch, and A. Cully. 1990. *Botanical Inventory of the Middle Rio Grande Bosque.* Forestry and Resource Conservation Division, New Mexico Energy, Minerals and Natural Resources Department, Santa Fe.

Smith, D. G. and P. E. Putnam. 1980. Anastomosed river deposits: modern and ancient examples in Alberta, Canada. *Canadian Journal of Earth Science* 17: 1396-1406.

Smith, L. M., M. D. Sprenger, and J. P. Taylor. 2002. Effects of discing salt cedar seedlings during riparian restoration efforts. *The Southwestern Naturalist* 47: 98-601.

Sogge, M. K., R. M. Marshall, S. J. Sferra and T. J. Tibbitts. 1997. *A Southwestern Willow Flycatcher Natural History Summary and Survey Protocol*. Technical Report NPS/NAUCPRS/NRTR-97/12. U.S. Department of the Interior, National Park Service, Colorado Plateau Research Station at Northern Arizona University, Flagstaff, Arizona.

Stahlecker, D. W. and N. S. Cox. 1997. *Bosque Biological Monitoring Program: Bird Populations in Rio Grande Valley State Park, Winter 1996-97 and Spring 1997.* City of Albuquerque Open Space Division, Albuquerque.

Stevens, L. E. and G. L. Waring. 1985. The effects of flooding on the riparian plant communities in Grand Canyon. Pages 81-86 *in*: Johnson, R. R., C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre (eds). *Riparian Ecosystems and Their Management: Reconciling Conflicting Uses*. U.S. Forest Service General Technical Report RM-120.

Stromberg, J. C., D. T. Patten, and B. D. Richter. 1991. Flood flows and dynamics of Sonoran riparian forests. *Rivers* 2: 221-235.

Stromberg, J. C., J. Fry, and D. T. Patton. 1997. Marsh development after large floods in an alluvial, arid-land river. *Wetlands* 17: 292-300.

Stuever, M. C. 1997. *Fire Induced Mortality of Rio Grande Cottonwood.* M.S. Thesis, University of New Mexico, Albuquerque. viii+84 pp.

Sublette, J. E., M. D. Hatch, and M. Sublette. 1990. *The Fishes of New Mexico*. University of New Mexico Press, Albuquerque, New Mexico.

Szaro, R. C. 1990. Southwestern riparian plant communities: site characteristics, tree species distributions, and size-class structures. *Forest Ecology and Management* 33/34: 315-334.

Tanner, J. T. 1986. Distribution of tree species in Louisiana bottomland forests. *Castanea* 51: 168-174.

Taylor, J. P., D. B. Wester, and L. M. Smith. 1999. Soil disturbance, flood management, and riparian woody plant establishment in the Rio Grande floodplain. *Wetlands* 19: 372-382.

Taylor, John P. 1999. Final Environmental Assessment: Conversion of salt cedar monocultures and mixed salt cedar/native bosque to native riparian bosque, wetland, and agricultural habitats. Bosque del Apache NWR, Socorro County, New Mexico.

Thompson, B.C., D.A. Leal, and R.A. Meyer. 1994. *Bird community composition and habitat importance in the Rio Grande system of New Mexico with emphasis on neotropical migrant birds*. New Mexico Cooperative Fish and Wildlife Research Unit and Fishery and Wildlife Sciences Department, New Mexico State University, Las Cruces, NM. 151 pp.

Tu, M; C. Hurd and J. M. Randall, 2001. Imazapyr. *In* Weed Control Methods Handbook: Tools & Techniques for use in natural areas. The Nature Conservancy. http://tncweeds.ucdavis.edu, version: April 2001.

Unitt, P. 1987. *Empidonax traillii extimus*: an endangered subspecies. *Western Birds* 18:137-162.

U.S. Army Corps of Engineers (USACE). 2002. Middle Rio Grande Bosque Jetty Jack Removal Evaluation Environmental Assessment, Albuquerque, New Mexico. July 2002. Prepared by U.S. Army Corps of Engineers, Albuquerque District, Albuquerque, New Mexico.

_____(USACE). 2004a. Supplemental Environmental Assessment to the Middle Rio Grande Bosque Jetty Jack Removal Evaluation Study Environmental Assessment. April 2004. Prepared by U.S. Army Corps of Engineers, Albuquerque District, Albuquerque, New Mexico

_____(USACE). 2004b. Supplemental Environmental Assessment for Temporary Emergency Bridges and Levee Operations and Maintenance, Bosque Wildfire Project, City of Albuquerque, Bernalillo County, New Mexico. June 2004. Prepared by U.S. Army Corps of Engineers, Albuquerque District, Albuquerque, New Mexico.

_____(USACE). 2004c. Assessment Report on the Feasibility of Jetty Jack Removal Along the Middle Rio Grande River", Albuquerque, New Mexico, Final Report, dated June 2, 2004, Prepared by U.S. Army Corps of Engineers St. Louis District,

Hydrologic & Hydraulics Branch, Potamology Section, Applied River Engineering Center, St. Louis, MO.

U.S. Census Bureau (USCB). 1999. "Population Estimates for Places (Sorted Alphabetically Within County)" Web site: http://www.census.gov/population/estimates/metro-city/placebyco/SC99T8_NM.txt. June 7.

_____(USCB). 2000a. "Sandoval County, State and County Quickfacts." Web site: http://quickfacts.census.gov/qfd/states/35/35043.html. May 22.

_____(USCB). 2000b. "Profiles of General Demographic Characteristics, 2000 Census of Population and Housing, New Mexico." Web site: http://www.census.gov/prod/cen2000/dp1/2kh35.pdf. May 22.

_____(USCB). 2001a. "Profiles of General Demographic Characteristics, 2000 Census of Population and Housing, New Mexico." Web site: http://www.census.gov/prod/cen2000/dp1/2kh00.pdf. May.

_____(USCB). 2001b. "Profiles of General Demographic Characteristics, 2000 Census of Population and Housing, New Mexico." Web site: http://www.census.gov/prod/cen2000/dp1/2kh35.pdf. May 22.

_____(USCB). 2002. "New Mexico Quick Facts" Bernalillo County. Web site: http://quickfacts.census.gov/qfd/states/35/35001.html. July 8.

_____(USCB). 2002. "New Mexico Quick Facts" Sandoval County. Web site: http://quickfacts.census.gov/qfd/states/35/35001.html. July 8.

U.S. Department of Agriculture (USDA). 1977. Soil Survey for Bernalillo County Area, New Mexico (Los Alamos County and Parts of Sandoval County).

U.S. Fish and Wildlife Service (USFWS). 1995. Endangered and threatened wildlife and plants; final rule to reclassify the Bald Eagle from endangered to threatened in all of the lower 48 states. *Federal Register*. 60:36000-36010.

USFWS. 1996. Endangered and threatened wildlife and plants; proposal to designate the whooping cranes of the Rocky Mountains as experimental nonessential and to remove whooping crane critical habitat designations from four locations. *Federal Register* 61(25): 4394-4401.

USFWS. 1999. *Rio Grande Silvery Minnow Recovery Plan*. Region 2, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

USFWS. 2004. "Incidental Take" and the Migratory Bird Treaty Act. Region 2, Migratory Bird Office.

Van Cleave, M. 1935. *Vegetation Changes in the Middle Rio Grande Conservancy District*. Unpublished M.S. Thesis, Biology Department, University of New Mexico, Albuquerque. 45 pp.

Ware, G. H. and W. T. Penfound. 1949. The vegetation of the lower levels of the floodplain of the South Canadian River in central Oklahoma. *Ecology* 30: 478-484.

Watson, J. R. 1912. Plant geography of north central New Mexico. *Contribution from the Hull Botanical Laboratory* 160: 194-217.

Weaver, J. E. 1960. Floodplain vegetation of the central Missouri valley and contacts of woodland with prairie. *Ecological Monographs* 30: 37-64.

Wheeler, R. H. and R. O. Kapp. 1978. Vegetational patterns on the Tittabawassee floodplain at the Goetz Grove Nature Center, Saginaw, Michigan. *Michigan Botanist* 17: 91-99.

Williams, G. P. and M. G. Wolman. 1984. *Downstream Effects of Dams on Alluvial Rivers*. Professional Paper 1286, U.S. Geological Survey, Washington, D.C.

Wozniak, Frank E. 1987. Irrigation in the Rio Grande Valley, New Mexico: A Study of the Development of Irrigation Systems Before 1945. Prepared for the New Mexico Historic Preservation Division. Santa Fe.

Zwank, P. J. 1994. Habitat use and population status of the meadow jumping mouse at Bosque del Apache National Wildlife Refuge. In: *Abstracts From Presentations at Arizona/New Mexico Chapters of The Wildlife Society, Sierra Vista, Arizona, February 4 and 5, 1994*.

Personal Communications

Brooks, Jim. USFWS Ecological Services Field Office.

Hawks Aloft Inc.

Krueper, Dave. USFWS Regional Office, Migratory Bird Program.

Parker, Doug. USFS Regional Office.

Stahlecker, Dale. Eagle Environmental.

US Army Corps of Engineers®
Albuquerque District
Environmental Resources Section

Figure 3A. Bosque Wildfire - Corrales Bosque Preserve and Sandia Pueblo

July 16, 2004

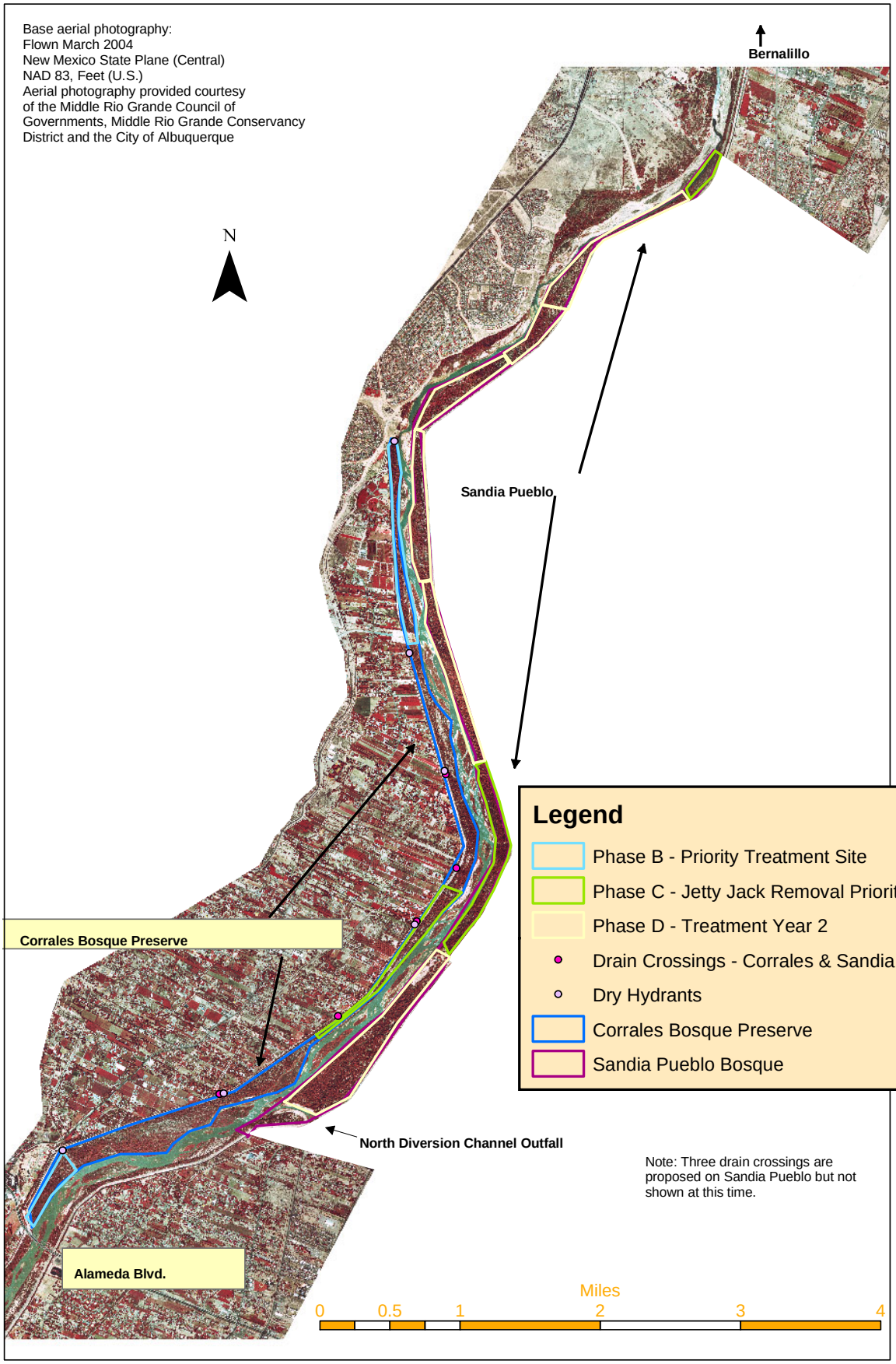
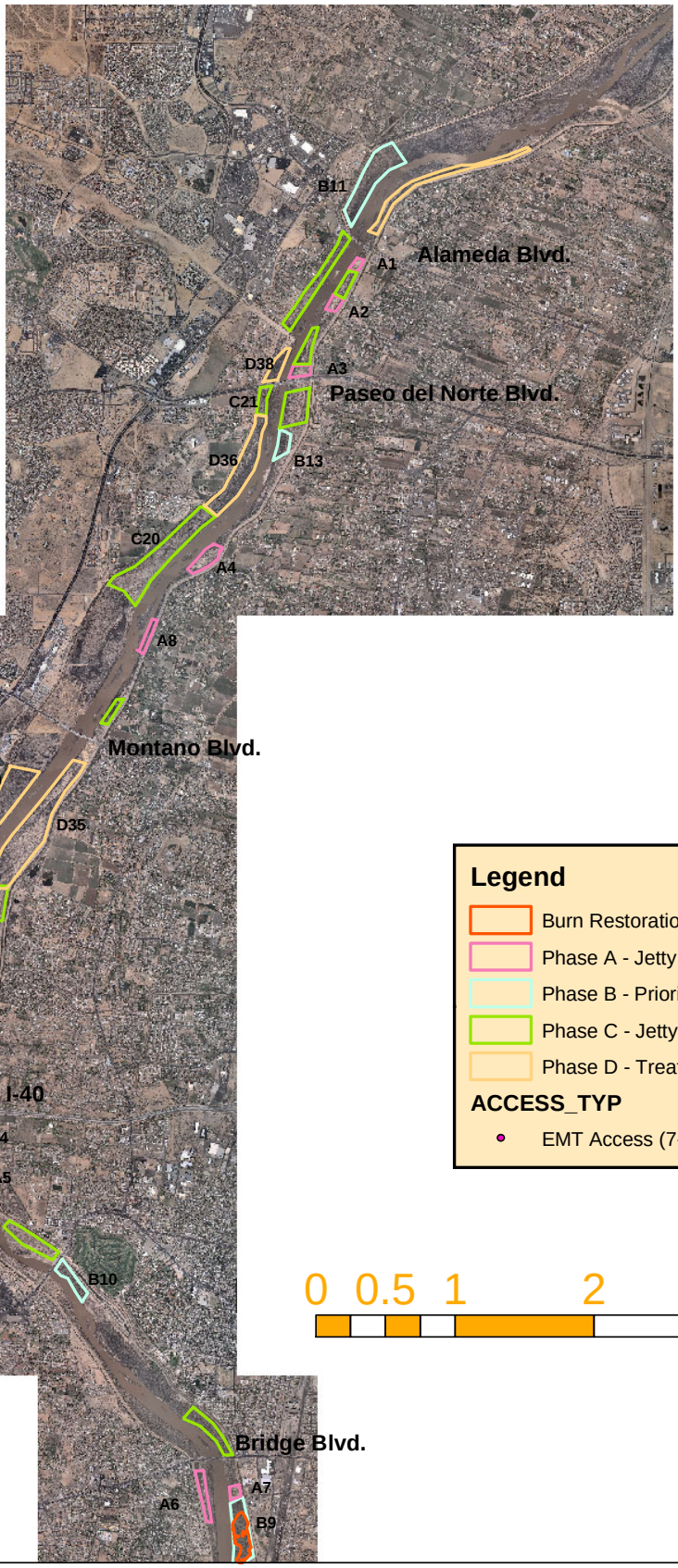


Figure 3B - Bosque Wildfire Albuquerque Reach

US Army Corps of Engineers®
Albuquerque District
Environmental Resources Section

July 12, 2004

Base aerial photography:
Flown March 2004
New Mexico State Plane (Central)
NAD 83, Feet (U.S.)
Aerial photography provided courtesy of the Middle Rio Grande Council of Governments, Middle Rio Grande Conservancy District and the City of Albuquerque



N

Legend

- Burn Restoration
- Phase A - Jetty Jack Removal and Revegetation
- Phase B - Priority Treatment Site
- Phase C - Jetty Jack Removal and Revegetation
- Phase D - Treatment Year 2

ACCESS_TYP

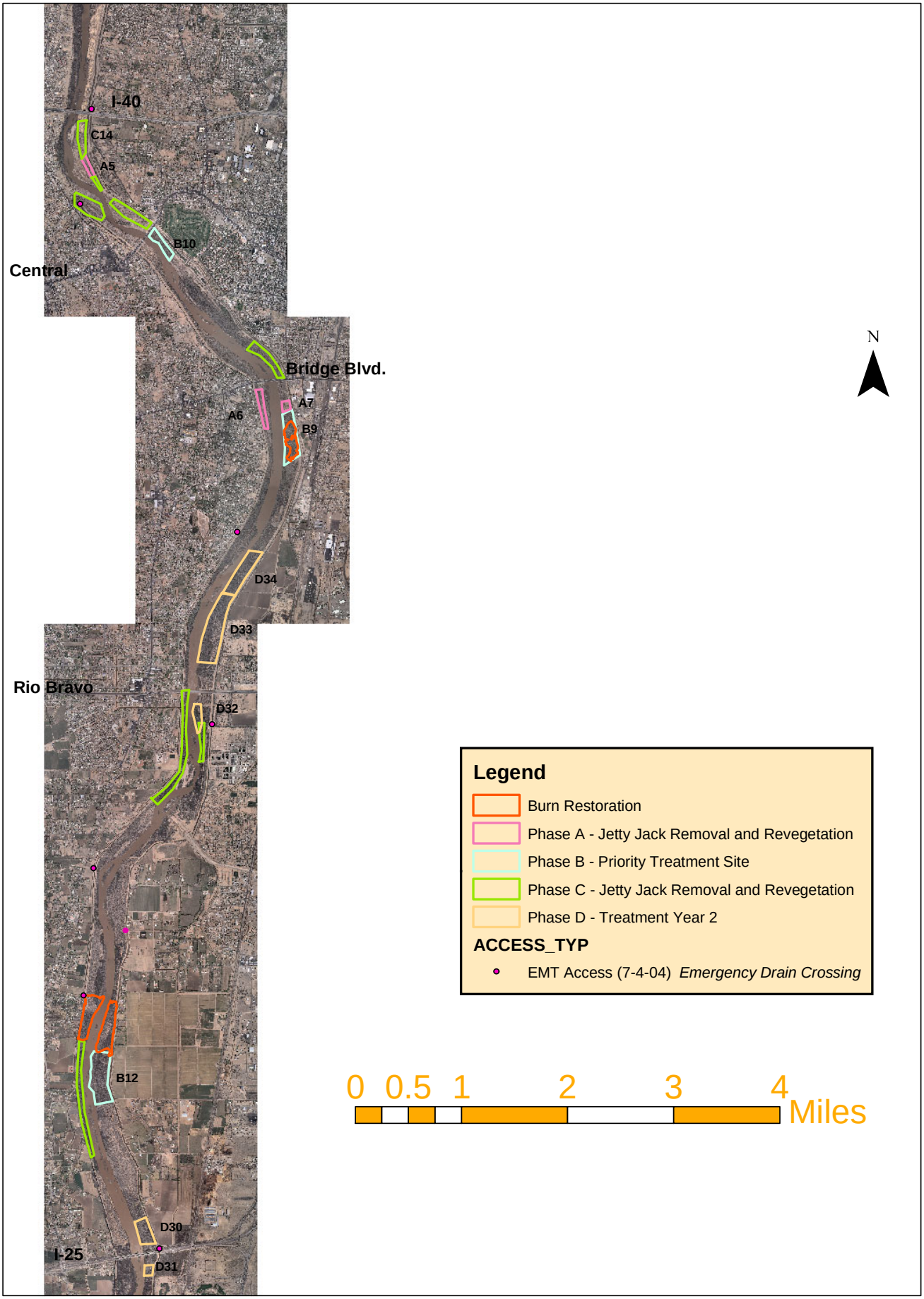
- EMT Access (7-4-04) *Emergency Drain Crossing*

0 0.5 1 2 3 4 Miles

Figure 3C - Bosque Wildfire Albuquerque Reach

US Army Corps of Engineers®
Albuquerque District
Environmental Resources Section

July 12, 2004



APPENDICES

APPENDIX A

Treatment Prescription

A. Tree Removal

Remove all non-native trees except for those designated as "elective" trees to remain by Corps staff (see trees listed at the end of this Prescription for species) and retain all native tree and shrub species.

1. Prescription Areas
    a. The cutting unit boundary will be designated in advance by Corps staff and will be marked with an appropriate flagging that is clearly visible to the equipment operators.
    b. Flagged cutting unit boundaries shall be maintained to prevent public access into the work site. The work site area shall also be marked with caution signs informing the public of the presence of heavy equipment and other related hazards.
    c. The Corps Albuquerque District will provide maps to the contractor.

2. Manually and mechanically extract or mulch non-native trees in the contracted area in the following manner:
    a. Manually treat non-native trees in sensitive areas as designated by Corps staff (adjacent to native vegetation or designated preserve locations). Flagging for protection should mark "Leave trees".
    b. Mechanically extract or cut down non-native trees that may be present in existing bosque forest. When extracting trees, all root material must be removed as well (root ripping). Equipment or personnel must not damage native vegetation. "Leave trees" should be marked by flagging for protection.
    c. Mechanically mulch or chip removed trees on-site. Mulched material left on site must not exceed 3 inches in diameter and any single piece may not exceed 6 inches in length.
    d. If using extraction method, contractor shall ensure that any resulting holes will be backfilled to original grade.
    e. Trees removed manually (prescriptive cutting or cut-stump method) will be cut as close to the ground as possible. No stumps may be left higher than 8 inches above the ground surface (except when "high-stumping" as needed—see C.1.b/C.3.b below).
    f. All stumps greater than 1 inch in diameter and any stems less than 1 inch in diameter will be treated as described in the Herbicide section of this prescription.
    g. Trees within the levees or within 30 feet of the toe of the slope should remain unless otherwise directed.

3. On sites where applicable, cut and remove dead and down wood (including 'jackstraw' trees lodged in jetty jacks) to achieve total average dead and down fuel depths of 10 tons per acre or less.

4. If fuel wood removal applies to the specific site, the woody material cut greater than 6 inches small-end diameter will be treated as fuel wood. Fuel wood must be cut into lengths not to exceed 4 feet and be stacked separately from slash pile(s) at a location(s) specified by the Corps Albuquerque District.

5. Dead and down rotting logs may be left on the ground surface for wildlife habitat. An average of five to ten large logs, brush piles, or small piles of logs per acre are recommended. Three to five logs of 12 inches or greater diameter should be left per acre for wildlife habitat. This is in addition to rotting logs. If dead and down logs are not present in areas, some trunks of larger diameter non-native trees could be left on the ground intact. Logs may be broken up or stacked to facilitate machinery operations. Any finished operation may not have high concentrations of logs, piled brush, or woody debris that will add significant fuel loading to the cleared site. Dead and down wood and slash more than 4 inches diameter should be moved outside the driplines of cottonwoods and other native trees where possible or at least ten feet from the base of the trees to see how it may affect fire behavior. Contractors should also rake piles of chips and duff away from the base of native trees to avoid heat kill in a fire.

6. Where they exist, the contractor will leave a minimum of five snags (standing dead trees) of 12 inch or greater diameter per acre, preferably with bark intact, for wildlife habitat. This prescription applies primarily to burn areas. Larger diameter trees that do not overhang trails, roads, or gathering areas will be retained. All cottonwood snags along the bank of the river will remain.

7. The Contractor will use directional felling to prevent damage to native trees and shrubs and will avoid damaging any research equipment or other designated areas on site.

B. <u>Slash and Downed Material Treatments</u>

1. For techniques using hand-work such as chain-saws and chippers, all slash less than 3 inches in diameter will be chipped. Contractor is encouraged to chip slash as it is generated. If chipping lags behind cutting, slash will be placed in piles no larger than 6 feet in diameter and no higher than 3 feet to be chipped.

2. All slash will be cut into lengths of no more than 4 feet for fire wood.

3. Chips will be spread out over the ground surface so that a thickness of no more than 2 inches in depth cover the ground surface. If material generated is greater than this amount then chips will be hauled to an approved site.

4. To the extent possible, mechanical mulching operations will be performed uniformly over the project site. This will allow mechanical operations to distribute mulched material uniformly over the ground surface.

5. If large mobile chipping machinery (such as horizontal grinders) is used for wood disposal, chipped material may be temporarily stockpiled but must be spread over the ground surface or removed before completion of the project.

6. On sites with excessive downed material (between 4 inches small-end diameter and 10 inches small-end diameter), the downed material shall be chipped or mulched to reduce fuel loading of the site. If excessive chipped or mulched material is anticipated to exceed 2 to 3 inches in depth, considerations must be made to remove the material from site.

C. <u>Herbicide Treatment</u>

Treat all cut stumps and/or whips according to the following methods:

1. Cut stumps greater than 1 inch in diameter (if using Garlon® at the specification of the contracting agency):
    a. Apply Garlon® 4 in a 30% Garlon®/70% vegetable oil mixed with blue pigment dye within 15 to 20 minutes of the original cutting in a sufficient amount to completely cover the cut surface.
    b. Individual and/or groups of stumps can be left "high-stumped" and then re-cut and sprayed later to facilitate herbicide uptake.

2. Whips less than 1 inch in diameter (if using Garlon® at the specification of the contracting agency):
    a. Apply Garlon® 4 in a 30% Garlon®/70% vegetable oil mixed with blue pigment dye.
    b. Apply mix directly to stem between 2" and 18" above the ground surface.

3. Cut stumps greater than 1 inch in diameter (if using Arsenal® at the specification of the contracting agency):
    a. Apply Arsenal®/Round-Up® in 30% or greater concentration mixed with blue pigment dye within 15 to 20 minutes of the original cutting in a sufficient amount to completely cover the cut surface.
    b. Individual and/or groups of stumps can be left "high-stumped" and then re-cut and sprayed later to facilitate herbicide uptake.

4. Whips less than 1 inch in diameter (if using Arsenal® at the specification of the contracting agency):
    a. Apply Arsenal®/Round-Up® in 30% or greater concentration mixed with blue pigment dye.
    b. Apply mix directly to stem between 2" and 18" above the ground surface.

5. Contractor will be required to re-treat stumps and whips that are missed during initial herbicide treatment following site inspection by the contracting agency.

6. Contractor will be responsible for follow-up herbicide treatment or mechanical removal of any root sprouts that occur as a result of using extraction method.

D. <u>Other Instructions</u>

1. Contractor shall obtain appropriate Special-Use Permits from the City of Albuquerque Open Space Division and licenses from the Middle Rio Grande Conservancy District to perform work. Contractor shall adhere to stipulations of permits or licenses, including vehicle control and access control.

2. Equipment access to the work site must be done using existing roads to the extent possible. Prior approval must be granted by the contracting agency or land-owner to transport equipment down any levee road or gain access to the levee. If the levee road is the only access due to jetty jacks being on the site location during treatment, the equipment must enter one time and exit one time to avoid ruts being created on the levee slope. Any significant damage to the levee slope, as determined by the contracting agency, must be repaired.

3. As part of the Smoking Policy within the Rio Grande Valley State Park, no smoking will be allowed in any open area. Smoking shall be confined to inside of vehicles. No exceptions shall be granted, and fines will be imposed for violations of the above by City of Albuquerque Open Space Division law enforcement.

4. No vehicles may be parked on levee roads at any time to ensure roadways are open for emergency vehicles and law enforcement.

5. Contractors shall observe a 15 m.p.h. speed limit on the levee roads and safely yield to all public trail users.

6. All gates must be closed and locked after each entry into the work site.

7. If any transient camp or shelter is found within the work site, the Contractor shall inform Corps staff. Officials will inspect the area and make determinations as to any further course of action. Contractor and contracting agency will be authorized to continue treatment operations based upon law enforcement decisions.

8. All construction activities would be in compliance to all applicable Federal, State, tribal and local regulations. All appropriate permits as described in the documentation above would be obtained.

E. Species Lists

Native Woody Species include:

Rio Grande Cottonwood	*Populus deltoides* var. *wizlesnii*
Black Willow/Goodding's Willow	*Salix gooddingii*
Peach-leaf Willow	*Salix amygdaloides*
New Mexico Olive	*Foresteria neomexicana*
Coyote Willow	*Salix exigua*
Seepwillow	*Baccharis salicina*
Golden currant	*Ribes aureum*
Wolfberry	*Lycium andersonii*
Skunkbush	*Rhus trilobata*
Silver Buffaloberry	*Shepherdia argentea*
False indigo bush	*Amorpha fruticosa*
Virginia creeper	*Parthenocissus inserta*

Non-Native Tree Species include:

Salt Cedar	*Tamarix* spp.
Russian Olive	*Eleagnus angustifolia*
Siberian Elm	*Ulmus pumila*
Tree-of-Heaven	*Ailanthus altissima*
Catalpa	*Catalpa* spp.

"Elective" Tree and Shrub Species include:

Russian Mulberry	*Morus alba* var. *tataria*
Black Locust	*Robinia pseudoacacia*
Honey Locust	*Gleditsia triacanthos*
Osage Orange	*Maclura pomifera*
Russian Olive (healthy young adults)	*Eleagnus angustifolia*
Maple	*Acer* spp.
Ash	*Fraxinus* spp.
Wild cherry	*Prunus* spp.
Apple	*Malus* spp.
Oregon grape	*Mahonia* spp.
Honeysuckle	*Lonicera* spp.

APPENDIX B
JETTY JACK REMOVAL AUTHORIZATIONS

AUTHORIZATION FOR REMOVAL OF JETTY JACKS

SITE: *Montano to Alameda – Selected Locations on the east side of the Rio Grande*

The jetty jacks at these sites are either owned or under the authority of the US Army Corps of Engineers, The Bureau of Reclamation or the Middle Rio Grande Conservancy District. In a cooperative effort the three agencies have reviewed these sites to evaluate whether jetty jack removal would conflict with flood control and erosion management. The sites where jetty jack removals have been approved are noted on the enclosed aerial photographs.

Jetty jack removal at these sites are approved with the following conditions:

Removal of all jetty jacks is acceptable at these sites with the exception of the bank line jetty jacks. The Contractor will be responsible for safe disposal of all jetty jack materials after they are removed from the work site. The MRGCD has first option to receive removed jetty jacks. The contractor shall stockpile the removed jacks on site for 10 days for MRGCD to claim.

All jetty jacks that are not removed, typically the bank line jetty jacks, must remain fully intact. Any broken cable or snapped/cut wires resulting from this work or the recent activity of others should be repaired. Additionally, where tieback lines are removed, new anchors are to be installed as needed to insure that the remaining lines of jetty jacks cannot migrate from their current position.

If only one or two jetty jacks within a continuous line are removed, the contractor will be required to reconnect the remaining jacks with a buried steel cable. The Contractor may not remove tieback lines (roughly perpendicular to the river) without also placing a buried anchor (known as a "deadman") to replace the tieback line.

Ongoing inspections as well as a final inspection will be conducted to insure that the terms and requirements as described above are followed.

	6/22/04
U. S. BUREAU OF RECLAMATION	DATE
	6/16/04
MIDDLE RIO GRANDE CONSERVANCY DISTRICT	DATE
	16 JUNE 2004
U. S. ARMY CORPS OF ENGINEERS	DATE
	15 Jun 2004
U. S. ARMY CORPS OF ENGINEERS	DATE

AUTHORIZATION FOR REMOVAL OF JETTY JACKS

SITE: *Central to I-40 – Selected Location on east side of the Rio Grande*

The jetty jacks at this site are either owned or under the authority of the US Army Corps of Engineers, The Bureau of Reclamation or the Middle Rio Grande Conservancy District. In a cooperative effort the three agencies have reviewed this site to evaluate whether jetty jack removal would conflict with flood control and erosion management. The site where jetty jack removals have been approved is noted on the enclosed aerial photographs.

Jetty jack removal at this site is approved with the following conditions:

Removal of all jetty jacks is acceptable at this site with the exception of the bank line jetty jacks. The Contractor will be responsible for safe disposal of all jetty jack materials after they are removed from the work site. The MRGCD has first option to receive removed jetty jacks. The contractor shall stockpile the removed jacks on site for 10 days for MRGCD to claim.

All jetty jacks that are not removed, typically the bank line jetty jacks, must remain fully intact. Any broken cable or snapped/cut wires resulting from this work or the recent activity of others should be repaired. Additionally, where tieback lines are removed, new anchors are to be installed as needed to insure that the remaining lines of jetty jacks cannot migrate from their current position.

If only one or two jetty jacks within a continuous line are removed, the contractor will be required to reconnect the remaining jacks with a buried steel cable. The Contractor may not remove tieback lines (roughly perpendicular to the river) without also placing a buried anchor (known as a "deadman") to replace the tieback line.

Ongoing inspections as well as a final inspection will be conducted to insure that the terms and requirements as described above are followed.

Mark Sims	6/22/04
U. S. BUREAU OF RECLAMATION	DATE
	6/17/04
MIDDLE RIO GRANDE CONSERVANCY DISTRICT	DATE
	16 JUNE 2004
U. S. ARMY CORPS OF ENGINEERS	DATE
	15 June 2004
U. S. ARMY CORPS OF ENGINEERS	DATE

AUTHORIZATION FOR REMOVAL OF JETTY JACKS

SITE: *South of Bridge Blvd. – Selected Locations on both sides of the Rio Grande*

The jetty jacks at these sites are either owned or under the authority of the US Army Corps of Engineers, The Bureau of Reclamation or the Middle Rio Grande Conservancy District. In a cooperative effort the three agencies have reviewed these sites to evaluate whether jetty jack removal would conflict with flood control and erosion management. The sites where jetty jack removals have been approved are noted on the enclosed aerial photographs.

Jetty jack removal at these sites are approved with the following conditions:

Removal of all jetty jacks is acceptable at these sites with the exception of the bank line jetty jacks. The Contractor will be responsible for safe disposal of all jetty jack materials after they are removed from the work site. The MRGCD has first option to receive removed jetty jacks. The contractor shall stockpile the removed jacks on site for 10 days for MRGCD to claim.

All jetty jacks that are not removed, typically the bank line jetty jacks, must remain fully intact. Any broken cable or snapped/cut wires resulting from this work or the recent activity of others should be repaired. Additionally, where tieback lines are removed, new anchors are to be installed as needed to insure that the remaining lines of jetty jacks cannot migrate from their current position.

If only one or two jetty jacks within a continuous line are removed, the contractor will be required to reconnect the remaining jacks with a buried steel cable. The Contractor may not remove tieback lines (roughly perpendicular to the river) without also placing a buried anchor (known as a "deadman") to replace the tieback line.

Ongoing inspections as well as a final inspection will be conducted to insure that the terms and requirements as described above are followed.

U. S. BUREAU OF RECLAMATION	6/22/04 DATE
MIDDLE RIO GRANDE CONSERVANCY DISTRICT	6/17/04 DATE
U. S. ARMY CORPS OF ENGINEERS	16 June 2004 DATE
U. S. ARMY CORPS OF ENGINEERS	15 June 2004 DATE

APPENDIX C
DOCUMENTATION OF CULTURAL RESOURCES AND CONSULTATION

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
4101 JEFFERSON PLAZA NE
ALBUQUERQUE NM 87109-3435

May 20, 2004

Rec'd 6-17-2004
GDE

Planning, Project and Program Management Division
Planning Branch
Environmental Resources Section

Honorable Wayne Taylor, Jr.
Chairman, Hopi Tribal Council
Post Office Box 123
Kykotsmovi, Arizona 86039

Dear Chairman Taylor:

The U.S. Army Corps of Engineers (Corps), Albuquerque District, is planning a habitat restoration project entitled, **Bosque Wildfire Project, New Mexico**. The Bosque Wildfire project plans to work in several riparian areas along the Rio Grande within the greater Albuquerque area in order to reduce high fuel loads to prevent future catastrophic wildfires. The proposed project is being conducted under the authority of Section 114 of the Energy and Water Appropriations Act of 2004 (Public Law 108-137).

The Bosque Wildfire project area is located within the Rio Grande Floodway, i.e., confined to the riparian areas along the river that are inside the flood control levees, within the City of Albuquerque, including portions of Corrales and Bernalillo County, and may extend into small portions of both the Pueblo of Sandia and the Pueblo of Isleta, in New Mexico. The project areas are located on lands under the sole, or joint jurisdiction, of Federal, state, county and city agencies, and tribal entities.

The proposed project would involve the removal of accumulated dead and down vegetation that has potential for wildfires, non-native vegetation, and old Kellner jetty-jacks that are no longer necessary. Native vegetation would be replanted.

The Corps is seeking input for consideration during the project planning. Your input will be used in preparing an environmental assessment to comply with the National Environmental Policy Act (NEPA) and other applicable laws and regulations. Therefore, please use this opportunity to identify

any potential issues or areas of concern. In order to expedite the project, please submit written comments, supporting information, data and/or references **no later than June 7, 2004.**

Forward your written comments on environmental concerns to Ondrea Linderoth-Hummel, biologist; and, comments on cultural resources to Gregory Everhart, archaeologist, at the above address.

If you have any questions or require additional information, please contact Ms. Linderoth-Hummel at (505) 342-3375 or by e-mail at ondrea.c.linderoth-hummel@usace.army.mil, or Mr. Everhart at (505) 342-3352.

Sincerely,

Julie A. Hall, Chief
Environmental Resources Section

Copies furnished:

U.S. Fish and Wildlife Service (Ms. Susan McMullin)
USEPA, Region 6 (Mr. Rob Lawrence)
U.S. Bureau of Reclamation (Mr. Ken Maxey)
Hopi Tribal Council (Mr. Wayne Taylor, Jr.)
Cultural Preservation Office (Mr. Leigh Kuwanwisiwma)
Navajo Nation (Mr. Joe Shirley, Jr.)
Navajo Nation Historic Preservation (Mr. Alan S. Downer, Ph.D)
White Mountain Apache Tribe (Honorable Dallas Massey, Sr.)
Historic Preservation-White Mountain Apache Tribe (Mr. John Welsh)
Pueblo of Sandia (Honorable Stuwart Paisano)
Language & Cultural Resources-Pueblo of Sandia (Mr. Sam Montoya)
Pueblo of Laguna (Honorable Roland Johnson)
NAGPRA Chairman-Pueblo of Laguna (Mr. Victor Sarracino)
Ysleta del Sur Pueblo (Honorable Albert Alvidrez)
Environmental Management-Ysleta del Sur Pueblo (Mr. Jacob Massoud)
New Mexico Forestry and Resources
Conservation Division (Mr. Robert Sivinski)
New Mexico Department of Game and Fish (Ms. Lisa Kirkpatrick)
New Mexico Department of Game and Fish (Mr. Mike Sloane)
New Mexico Department of Game and Fish (Mr. Luis Rios)
New Mexico Interstate Stream Commission (Mr. Estevan Lopez)
New Mexico Environmental Department (Ms. Marcy Leavitt)
Bernalillo County Public Works (Mr. Tim West)

Bernalillo County Public Works (Mr. Martin Garcia)
City of Albuquerque Open Space (Dr. Matt Schmader)
City of Albuquerque Environmental Health (Mr. Alfredo Santistevan)
Albuquerque Fire Department (Mr. Robert Halton)
City of Albuquerque Public Works (Mr. Dan Hogan)
Village of Corrales (Ms. Claudia Smith)
Rio Grande Nature Center (Ms. Rebecca Tydings)
Middle Rio Grande Conservancy District (Mr. Subhas Shah)
AMAFCA (Mr. John Kelly)
Ms. Amy Jaeger

X I have determined that the removal of the accumulated dead and down vegetation WILL NOT affect any know Traditional Cultural Properties, and that the project calls for revegetation only.

Roland E. Johnson
Governor
PUEBLO OF LAGUNA

June 8, 2004
Date:

APPENDIX D
U.S. FISH AND WILDLIFE SERVICE COORDINATION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

May 20, 2004

Cons. #2-22-04-I-480

Julie Hall, Chief, Environmental Resources
U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Plaza NE
Albuquerque, New Mexico 87109

Dear Ms. Hall:

This responds to your April 30, 2004 letter regarding proposed survey locations for the southwestern willow flycatcher (*Empidonax traillii extimus*) (flycatcher) in and around the Albuquerque reach of the Rio Grande. On May 20, 2004, you provided us with maps of your proposed survey locations and wanted to be assured that the coordination and information provided to us is adequate for the section 7 consultation process associated with the forthcoming bosque wildfire project. It is our understanding that you are currently developing this proposal, but it will likely include: fuels reduction, exotic vegetation removal, jetty jack removal, revegetation, and access improvements through this reach of river.

My staff has participated in a variety of field and office meetings to facilitate discussions between all of the agencies involved in the overall efforts to reduce the risk of catastrophic wildfire in the bosque. During these meetings, we provided technical assistance concerning potential flycatcher habitat so that you could determine which areas to survey in relation to your upcoming project. We support your efforts to survey for the flycatcher in areas that you have identified as potential flycatcher habitat. The flycatcher survey maps and other information you provided are adequate for the section 7 consultation process.

We encourage efforts such as this project to reduce the risk of wildfire in the wildland urban interface, while conducting restoration activities. Protecting human life and property is the highest priority. In addition, threats of wide-scale habitat loss due to fire are real and immediate on many private and public lands. We appreciate your efforts to coordinate activities associated with your bosque projects with our office. We will continue collaborating with you and other partners to provide technical assistance, coordination, and,

in some instances, section 7 consultation for proactive projects to reduce the potential for emergency events (e.g., wildland urban interface fuels management).

Please let us know if we can be of further assistance. If you have any questions, please contact Eric Hein at the letterhead address or at (505) 761-4735.

Sincerely,

Susan MacMullin

Susan MacMullin
Field Supervisor

cc:
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division, Santa Fe, New Mexico
Superintendent, City of Albuquerque Open Space Division, Albuquerque, New Mexico
Chief Engineer, Middle Rio Grande Conservancy District, Albuquerque, New Mexico
Manager, Rio Grande Nature Center State Park, Albuquerque, New Mexico

APPENDIX E
MSDS CHEMICAL SHEETS

BASF Corporation

BASF

MATERIAL SAFETY DATA SHEET

Agricultural Products Group
P.O.Box 13528,
Research Triangle Park, NC 27709
(919) 547-2000

EMERGENCY TELEPHONE NUMBERS:

BASF Corporation: 1 (800) 832-HELP

CHEMTREC: 1 (800) 424-9300

Product No.: 579690 **Arsenal® 2 ASU herbicide**

Date Prepared: 9/11/2000 **Date Revised: 6/24/2002**

SECTION I

Trade Name: Arsenal® 2 ASU herbicide

Chemical Name: 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid, salt with 2-propanamine (1:1)

Synonyms: Isopropylamine of imazapyr; AC252, 925; CL252, 925; **Formula: C(13)H(15)N(3)O(3).C(3)H(9)N**

Chemical Family: Imidazolinone **Mol Wt: 320.4**

SECTION II - INGREDIENTS

COMPONENT	CAS NO.	%	PEL/TLV - SOURCE
Isopropylamine salt of Imazapyr	81510-83-0	28.7	0.5 mg/m3 TWA BASF recommended
Inerts	N/A	71.3	None established

SARA Title III Section 313: Not Listed

SECTION III - PHYSICAL DATA

BOILING/MELTING POINT@760mm Hg: N/D **pH: 6.6 - 7.2**

VAPOR PRESSURE mmHg @ 20ºC: N/D

SPECIFIC GRAVITY OR BULK DENSITY: 1.04 - 1.07 g/mL

SOLUBILITY IN WATER: Soluble

APPEARANCE: Clear blue liquid **ODOR: Ammonia** **INTENSITY: Slight**

SECTION IV - FIRE AND EXPLOSION DATA

FLASH POINT (TEST METHOD): >210ºF SFCC **AUTOIGNITION TEMP: > 200º F**

FLAMMABILITY LIMITS IN AIR (% BY VOL): **LOWER: N/D** **UPPER: N/D**

NFPA 704 HAZARD CODES

HEALTH: 1 **FLAMMABLE: 1** **INSTABILITY: 0** **OTHER: N/R**

NFPA 30 STORAGE CLASSIFICATION: Class IIIB

EXTINGUISHING MEDIUM	**Use water fog, foam, CO(2), or dry chemical extinguishing media.**
SPECIAL FIREFIGHTING PROCEDURES	**Firefighters should be equipped with self-contained breathing apparatus and turnout gear.**
UNUSUAL FIRE EXPLOSION HAZARDS	**None known.**

SELECT ACRONYM KEY

N/A - Not available; N/D - Not determined; N/R - Not rated; N/E - Not established

SECTION V - HEALTH DATA

TOXICOLOGICAL TEST DATA:

Data for formulated product:

Rat, Oral LD50 (combined sexes) > 5000 mg/kg

Rabbit, Dermal LD50 (combined sexes) > 2148 mg/kg

Rat, Inhalation LC50 (4 hr) - Not available

Rat, Inhalation LC50 (1 hr calculated) - Not available

Rabbit, Eye Irritation - Irritating (complete recovery by 7 days)

Rabbit, Skin Irritation - Mildly irritating

Guinea pig, Dermal Sensitizer - Not available

OSHA, NTP, or IARC Carcinogen: Not listed.

EFFECTS OF OVEREXPOSURE:

See Product Label and Directions For Use for additional precautionary statements.

CAUTION

Avoid contact with skin, eyes, and clothing. Avoid breathing spray mist.

Existing medical conditions aggravated by this product:

None known.

FIRST AID PROCEDURES

If swallowed:	Call a physician or Poison Control Center. Drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. If person is unconscious, do not give anything by mouth and do not induce vomiting.
If in eyes:	Flush eyes with plenty of water. Call a physician if irritation persists.
If on skin:	Wash with plenty of soap and water. Get medical attention if irritation persists.
If inhaled:	Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.
Note to physician:	Treat symptomatically. No specific antidote.
Note:	Have the product container or label with you when calling a poison control center or doctor or going for treatment.

SECTION VI - REACTIVITY DATA

STABILITY: Stable. Do not store below 32º F or above 100º F.

CONDITIONS TO AVOID: Store in original container in cool,dry, well ventilated place away from ignition sources, heat or flame.

CHEMICAL INCOMPATIBILITY: Oxidizing agents, reducing agents. Corrosive to mild steel, brass.

HAZARDOUS DECOMPOSITION PRODUCTS: Including but not limited to oxides of carbon and nitrogen.

HAZARDOUS POLYMERIZATION: Does not occur.

CONDITIONS TO AVOID: Does not polymerize.

CORROSIVE TO METAL: Mild steel, brass **OXIDIZER:** No

SECTION VII - PERSONAL PROTECTION

Users of a pesticidal end use product should refer to the product label for personal protective equipment requirements.

RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:

Respiratory Protection:

Supplied air respirators should be worn if large quantities of mist/dust are generated or prolonged exposure possible.

Eye Protection:

Chemical goggles when respirator does not provide eye protection.

Protective Clothing:

Gloves and protective clothing as necessary to prevent skin contact.

Ventilation:

Whenever possible, engineering controls should be used to minimize the need for personal protective equipment.

SECTION VIII - ENVIRONMENTAL DATA

ENVIRONMENTAL TOXICITY DATA

This product is harmless to fish, and toxic to aquatic invertebrates.

SARA 311/312 REPORTING

FIRE: N **PRESSURE: N** **REACTIVITY: N** **ACUTE: Y** **CHRONIC: N** **TPQ(lbs): N/R**

SPILL AND LEAK PROCEDURES:

In case of large scale spillage of this product, avoid contact, isolate area and keep out animals and unprotected persons. Call CHEMTREC (800 424-9300) or BASF Corporation (800 832-HELP). For a small spill, wear personal protective equipment as specified on the label.

FOR A LIQUID SPILL: Dike and contain the spill with inert material (sand, earth, etc.) and transfer the liquid and solid diking materials to separate containers for disposal.

FOR A SOLID SPILL: Sweep solid into a drum for re-use or disposal. Remove personal protective equipment and decontaminate it prior to re-use.

HAZARDOUS SUBSTANCE SUPERFUND: No **RQ(lbs): None**

WASTE DISPOSAL METHOD:

Pesticide wastes are acutely hazardous. Wastes resulting from this product may be disposed of on site or at an approved waste disposal facility. Improper disposal of excess pesticide, spray mix or rinsate is a violation of federal law. If these wastes cannot be disposed of according to label instructions, contact the state agency responsible for pesticide regulation or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

HAZARDOUS WASTE 40CFR261: No **HAZARDOUS WASTE NUMBER: None**

CONTAINER DISPOSAL:

FOR PLASTIC CONTAINERS: Triple rinse (or equivalent) and add rinsate to the spray tank. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by incineration, or if allowed by state and local authorities, by burning. If burned, stay out of smoke.

FOR BULK CONTAINERS: Reusable containers should be returned to the point of purchase for cleaning and re-filling.

FOR MINIBULK CONTAINERS: Clean all tanks on an approved loading pad so rinsate can be collected and mixed into the spray solution or into a dedicated tank. Using a high pressure sprayer, rinse several times with small volumes of water to minimize rinsate.

SECTION IX - SHIPPING DATA - PACKAGE AND BULK

D.O.T. PROPER SHIPPING NAME (49CFR172.101-102):
None

HAZARDOUS SUBSTANCE (49CFR CERCLA LIST):
None
RQ(lbs): None

D.O.T. HAZARD CLASSIFICATION (CFR 172.101-102):

PRIMARY	SECONDARY
None	None

D.O.T. LABELS REQUIRED (49CFR172.101-102):	D.O.T. PLACARDS REQUIRED (CFR172.504):	POISON CONSTITUENT (49CFR172.203(K)):
None	None	None

BILL OF LADING DESCRIPTION

Compounds, tree or weed killing, NOIBN
This product is not regulated by the Department of Transportation (DOT). It does not meet the definition of DOT corrosive (49 CFR 173.136).

CC NO.: Not applicable **UN/NA CODE:**

SECTION X - ADDITIONAL INFORMATION

Arsenal® 2 ASU herbicide

KEEP OUT OF REACH OF CHILDREN

CAUTION

BASF Corporation

Agricultural Products Group
P.O.Box 13528,
Research Triangle Park, NC 27709
(919) 547-2000

DISCLAIMER

IMPORTANT: WHILE THE DESCRIPTIONS, DESIGNS, DATA AND INFORMATION CONTAINED HEREIN ARE PRESENTED IN GOOD FAITH AND BELIEVED TO BE ACCURATE, IT IS PROVIDED FOR YOUR GUIDANCE ONLY. BECAUSE MANY FACTORS MAY AFFECT PROCESSING OR APPLICATION/USE, WE RECOMMEND THAT YOU MAKE TESTS TO DETERMINE THE SUITABILITY OF A PRODUCT FOR YOUR PARTICULAR PURPOSE PRIOR TO USE. NO WARRANTIES OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE REGARDING PRODUCTS DESCRIBED OR DESIGNS, DATA OR INFORMATION SET FORTH, OR THAT THE PRODUCTS, DESIGNS, DATA OR INFORMATION MAY BE USED WITHOUT INFRINGING THE INTELLECTUAL PROPERTY RIGHTS OF OTHERS. IN NO CASE SHALL THE DESCRIPTIONS, INFORMATION, DATA OR DESIGNS PROVIDED BE CONSIDERED A PART OF OUR TERMS AND CONDITIONS OF SALE. FURTHER, YOU EXPRESSLY UNDERSTAND AND AGREE THAT THE DESCRIPTIONS, DESIGNS, DATA, AND INFORMATION FURNISHED BY BASF HEREUNDER ARE GIVEN GRATIS AND BASF ASSUMES NO OBLIGATION OR LIABILITY FOR THE DESCRIPTION, DESIGNS, DATA AND INFORMATION GIVEN OR RESULTS OBTAINED, ALL SUCH BEING GIVEN AND ACCEPTED AT YOUR RISK.

Chem Service Inc.
Material Safety Data Sheet

Date: Thursday, April 22, 2004
Last Revised Date: 11/19/03

SECTION 1 - CHEMICAL PRODUCT and COMPANY IDENTIFICATION

Catalog Number: PS-417
Description: Triclopyr
Other Name(s): 3.5.6-Trichloro-2-pyridinyloxyacetic acid/Crossbow(TM)/Garlon(TM)

Supplied by CHEM SERVICE, Inc. PO BOX 599, WEST CHESTER, PA 19381 (610)-692-3026
EMERGENCY PHONE: 1-610-692-3026

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

CAS No.: 55335-06-3
Description: Triclopyr
EINECS No.: Not Available
Hazard Symbols: Not Available

SECTION 3 - HAZARDS IDENTIFICATION

Contact lenses should not be worn in the laboratory.All chemicals should be considered hazardous - Avoid direct physical contact!
May be harmful by inhalation, ingestion, or skin absorption. Can cause eye irritation. Can cause skin irritation. Dust and/or vapors can cause irritation to respiratory tract. Can be irritating to mucous membranes.

SECTION 4 - FIRST AID MEASURES

An antidote is a substance intended to counteract the effect of a poison. It should be administered only by a physician or trained emergency personnel. Medical advice can be obtained from a POISON CONTROL CENTER.
In case of contact: Flush eyes continuously with water for 15-20 minutes. Flush skin with water for 15-20 minutes. If no burns have occurred-use soap and water to cleanse skin. If inhaled remove patient to fresh air. Administer oxygen if patient is having difficulty breathing. If patient has stopped breathing administer artificial respirations. If patient is in cardiac arrest administer CPR. Continue life supporting measures until medical assistance has arrived. If patient is exhibiting signs of shock - Keep warm and quiet. Contact Poison Control Center immediately if necessary. Do not administer liquids or induce vomiting to an unconscious or convulsing person. If patient is vomiting-watch closely to make sure airway does not become obstructed by vomit. If swallowed, rinse out mouth with water, providing the person is conscious. Get medical attention if necessary. Remove and wash contaminated clothing.

SECTION 5 - FIRE AND EXPLOSION DATA

Flash Point: Not Available
Extinguishing Media: Carbon dioxide, dry chemical powder or spray.
Upper Explosion Limit: Not Available
Lower Explosion Limit: Not Available
Autoignition Temperature: Not Available

NFPA Hazard Rating: Not Available

SECTION 6 - ACCIENTAL RELEASE MEASURES

Spills or leaks: Evacuate area. Wear appropriate OSHA regulated equipment. Ventilate area. Sweep up and place in an appropriate container. Hold for disposal.

Wash contaminated surfaces to remove any residues. Remove contaminated cloting and wash before reuse.

SECTION 7 - HANDLING AND STORAGE

Handling:
This chemical should be handled only in a hood. Eye shields should be worn.
Use appropriate OSHA/MSHA approved safety equipment.
Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation
Wash thoroughly after handling.

Storage:
Store in a cool dry place. Store only with compatible chemicals.
Keep tightly closed.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

OSHA PEL (TWA): Not Available
ACGIH TLV (TWA): Not Available
ACGIH TLV (STEL): Not Available

Personal Protective Equipment
Eyes: Wear Safety Glasses.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to minimize contact with skin.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant a respirator's use.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Color: colorless
Phase: Crystalline solid
Melting Point: 148-150 C
Boiling Point: Not Available
Specific Gravity: Not Available
Vapor Density: 1.26E-6mm@
Vapor Preasure: Not Available
Solubility in Water: Very slightly soluble
Odor: Not Available
Evaporation Rate (Butyl acetate=1): Not Available
Molecular Weight: 256.47
Molecular Formula: C7H4Cl3NO3

SECTION 10 - STABILITY AND REACTIVITY

Sensitive to light - dark color does not affect purity. Readily absorbed and retained on clothing and/or shoes.

SECTION 11 - TOXICOLOGY INFORMATION

RTECS: AJ9000000
Oral Rat or Mouse LD50: 713mg/kg
Dermal Rat or Mouse LD50: Not Available
Rat or Mouse LC50 : Not Available

Carcinogenicity
OSHA: No
IARC: No
NTP: No
ACGIH: No
NIOSH: No
Other: No

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: Not Available
Environmental Fate: Not Available

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL: Burn in a chemicals incinerator equipped with an afterburner and scrubber.

SECTION 14 - TRANSPORTATION INFORMATION

UN Number: UN2811
Class: 6.1
Packing Group: III
Proper Shipping Name: Toxic Solid, Organic, nos *

SECTION 15 - REGULATORY INFORMATION

European Labeling in Accordance with EC Directives
Hazard Symbols: Not Available

Risk Phrases: Not Available

Safety Phrase: Not Available

SECTION 16 - OTHER INFORMATION

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded MSDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Material Safety Data Sheet (MSDS) is intended only for use with Chem Service, Inc. products

and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an MSDS for a solution or mixture the user should refer to the MSDS for every component of the solution or mixture. Chem Service warrants that this MSDS is based upon the most current information available to Chem Service at the time it

was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY,
EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR
ANY PARTICULAR PURPOSE. This MSDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE
FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

This product is furnished FOR LABORATORY USE ONLY!

MATERIAL SAFETY DATA SHEET

Emergency Phone: 800-992-5994
Dow AgroSciences LLC
Indianapolis, IN 46268

Effective Date: 11/24/03
Product Code: 38321
MSDS: 004422

GARLON* 3A HERBICIDE

1. PRODUCT AND COMPANY IDENTIFICATION:

PRODUCT: Garlon* 3A Herbicide

COMPANY IDENTIFICATION:
Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, IN 46268-1189

2. COMPOSITION/INFORMATION ON INGREDIENTS:

Triclopyr ((3,5,6-trichloro-2-pyridinyl)oxy)acetic acid), triethylamine salt	CAS # 057213-69-1	44.4%
Inert Ingredients, Total, Including		55.6%
Ethanol	CAS # 000064-17-5	
Triethylamine (N,N-Diethylethanamine)	CAS # 000121-44-8	
Ethylenediaminetetraacetic Acid (EDTA)	CAS # 000060-00-4	

3. HAZARDOUS IDENTIFICATIONS:

EMERGENCY OVERVIEW

Hazardous Chemical. Light purple-pink liquid, ammonia-like odor. May cause eye irritation with corneal injury. May cause skin irritation. LD_{50} for skin absorption is >5000 mg/kg. Oral LD_{50} is 1847-2574 mg/kg. Toxic and irritating gases may be formed during fire conditions.
EMERGENCY PHONE NUMBER: 800-992-5994

POTENTIAL HEALTH EFFECTS: This section includes possible adverse effects, which could occur if this material is not handled in the recommended manner.

EYE: May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur Vapor of amines may cause swelling of the cornea resulting in visual disturbances such as blurred or hazy vision. Bright lights may appear to be surrounded by halos. Effects may be delayed and typically disappear spontaneously. When tested on animals, dilutions of this material were less irritating to eyes than the undiluted products.

SKIN: Prolonged or repeated exposure may cause skin irritation, even a burn. When tested on animals, dilutions of this material were less irritating to skin than the undiluted product. Prolonged or frequently repeated skin contact may cause allergic skin reactions in some individuals. With the dilute mix, no allergic skin reaction is expected. Prolonged skin contact is unlikely to result in absorption of harmful amounts. The LD_{50} for skin absorption in rabbits is >5000 mg/kg.

INGESTION: Low toxicity if swallowed. The oral LD_{50} for rats is 2574 mg/kg (male) and 1847 mg/kg (female). Small amounts swallowed incidental to normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury. Swallowing may cause gastrointestinal irritation or ulceration.

INHALATION: Brief exposure (minutes) is not likely to cause adverse effects.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: Excessive exposure may cause liver or kidney effects.

CANCER INFORMATION: Triclopyr did not cause cancer in laboratory animal studies. This material contains ethanol. Epidemiology studies provide evidence that drinking of alcoholic beverages (containing ethanol) is associated with cancer, and IARC has classified alcoholic beverages as carcinogenic to humans.

TERATOLOGY (BIRTH DEFECTS): For triclopyr, birth defects are unlikely. Even exposures having an adverse effect on the mother should have no effect on the fetus. Ethanol has been shown to cause birth defects and toxicity to the fetus in laboratory animal tests. It has also been shown to cause human fetotoxicity and/or birth defects when ingested during pregnancy.

REPRODUCTIVE EFFECTS: For triclopyr, in laboratory animal studies, effects on reproduction have been seen only at doses that produced significant toxicity to the parent animals. Ingestion of large amounts of ethanol has been shown to interfere with fertility in human males.

4. FIRST AID:

EYES: Wash immediately and continuously with flowing water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Obtain prompt medical consultation, preferably from an ophthalmologist.

SKIN: Wash skin with plenty of water.

INGESTION: Do not induce vomiting. Give one cup (8 ounces or 240 ml) of water or milk if available and transport to a medical facility. Do not give anything by mouth to an unconscious person.

INHALATION: No emergency medical treatment necessary.

NOTE TO PHYSICIAN: Due to irritant properties, swallowing may result in burns/ulceration of mouth, stomach & lower gastrointestinal tract with subsequent stricture. Aspiration of vomitus may cause lung injury. Suggest endotracheal/esophageal control if lavage is done. If burn is present, treat as any thermal burn, after decontamination. Exposure to amine vapors may cause minor transient edema of the corneal epithelium (glaucopsia) with blurred vision, blue haze & halos around bright objects. Effects disappear in a few hours and temporarily reduce ability to drive vehicles. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. FIRE FIGHTING MEASURES:

FLASH POINT: 110°F (43°C)
METHOD USED: TCC
FLAMMABLE LIMITS
LFL: Not determined
UFL: Not determined

EXTINGUISHING MEDIA: Alcohol foam and CO_2.

FIRE & EXPLOSION HAZARDS: Toxic, irritating vapors may be formed or given off if product is involved in fire. Although product is water-based, it has a flash point due to the presence of small amounts of ethanol and triethylamine.

FIRE-FIGHTING EQUIPMENT: Use positive-pressure, self-contained breathing apparatus and full protective clothing.

6. ACCIDENTAL RELEASE MEASURES:

ACTION TO TAKE FOR SPILLS/LEAKS: Contain small spills and absorb with an inert material such as clay or dry sand. Report large spills to Dow AgroSciences at 800-992-5994.

7. HANDLING AND STORAGE:

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: **HANDLING:** Keep out of reach of children. Causes irreversible eye damage. Harmful if inhaled or absorbed through skin. Prolonged or frequently repeated skin contact may cause allergic skin reaction in some individuals. Avoid contact with eyes, skin, clothing, breathing vapor, or spray mist. Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
STORAGE: Store above 28°F or agitate before use. Store in original container. See product label for handling/storage precautions relative to the end use of this product.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION:

These precautions are suggested for conditions where the potential for exposure exists. Emergency conditions may require additional precautions.

EXPOSURE GUIDELINE(S):
Ethanol (ethyl alcohol): ACGIH TLV and OSHA PEL are 1000 ppm. ACGIH classification is A4.
3,5,6-Trichloro-2-pyridyloxyacetic acid (Triclopyr), triethylamine salt: Dow AgroSciences Industrial Hygiene Guideline is 2 mg/M^3 as acid equivalent; Skin.
Triethylamine: ACGIH TLV is 1 ppm TWA, 3 ppm STEL, Skin. OSHA PEL is 10 ppm TWA, 15 ppm STEL.

A "skin" notation following the exposure guideline refers to the potential for dermal absorption of the material including mucous membranes and the eyes either by contact with vapors or by direct skin contact. It is intended to alert the reader that inhalation may not be the only route of exposure and that measures to minimize dermal exposures should be considered.

ENGINEERING CONTROLS: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:

EYE PROTECTION: Use chemical goggles. Eye wash fountain should be located in immediate work area. If exposure causes eye discomfort, use a NIOSH approved full-face respirator.

SKIN PROTECTION: When prolonged or frequently repeated contact could occur, use chemically protective clothing resistant to this material. Selection of specific items such as face shield, gloves, boots, and apron or full-body suit will depend on operation.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use a NIOSH approved air-purifying respirator.

APPLICATORS AND ALL OTHER HANDLERS: Refer to the product label for personal protective clothing and equipment.

9. PHYSICAL AND CHEMICAL PROPERTIES:

BOILING POINT: Not determined
VAPOR PRESSURE: Not determined
VAPOR DENSITY: Not applicable
SOLUBILITY IN WATER: Miscible
SPECIFIC GRAVITY: 1.135 (68/68°F)
APPEARANCE: Light purple/pink liquid
ODOR: Ammonia-like odor

10. STABILITY AND REACTIVITY:

STABILITY: (CONDITIONS TO AVOID) Avoid sources of ignition if temperature is near or above flash point.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Any oxidizing agent. Consult manufacturer for specific cases.

HAZARDOUS DECOMPOSITION PRODUCTS: Nitrogen oxides and hydrogen chloride may be formed under fire conditions.

HAZARDOUS POLYMERIZATION: Not known to occur.

11. TOXICOLOGICAL INFORMATION:

MUTAGENICITY: For triclopyr and ethanol: in-vitro genetic toxicity studies were negative. For triclopyr: animal genetic toxicity studies were negative. For ethanol: animal genetic toxicity studies were negative in some cases and positive in other cases.

12. ECOLOGICAL INFORMATION:

ENVIRONMENTAL FATE:

MOVEMENT & PARTITIONING: Based largely or completely on information for triclopyr. Bioconcentration potential is low (BCF <100 or Log Pow <3).

DEGRADATION & PERSISTENCE: Biodegradation under aerobic static laboratory conditions is high (BOD20 or BOD28/ThOD >40%). The 20-Day biochemical oxygen demand (BOD20) is 0.30 p/p. Theoretical oxygen demand (ThOD) is calculated to be 0.75 p/p.

ECOTOXICOLOGY: Material is slightly toxic to aquatic organisms on an acute basis (LC_{50} or EC_{50} is between 10 and 100 mg/L in most sensitive species).
Acute EC_{50} for shell deposition inhibition in Eastern oyster *(Crassostrea virginica)* is 56-87 mg/L.
Acute LC_{50} for rainbow trout *(Oncorhynchus mykiss)* is 400 mg/L.
Acute LC_{50} for channel catfish *(Ictalurus punctatus)* is 446 mg/L.
Acute LC_{50} for pink shrimp *(Penaeus duorarum)* is 895 mg/L.
Growth inhibition EC_{50} for green alga *(Selenastrum capricornutum)* is 45 mg/L.

MATERIAL SAFETY DATA SHEET

Emergency Phone: 800-992-5994
Dow AgroSciences LLC
Indianapolis, IN 46268

GARLON* 3A HERBICIDE

Effective Date: 11/24/03
Product Code: 38321
MSDS: 004422

13. DISPOSAL CONSIDERATIONS:

DISPOSAL METHOD: Do not contaminate food, feed, or water by storage or disposal. Excess wastes are toxic. Improper disposal or excess wastes are a violation of federal law. If wastes resulting from the use of this product cannot be disposed of according to label instructions, dispose of these wastes at an approved facility. Contact your state pesticide or environmental control agency, or the hazardous waste representative at the nearest EPA regional office for guidance.

14. TRANSPORT INFORMATION:

U.S. DEPARTMENT OF TRANSPORTATION (DOT) INFORMATION:

For non-bulk shipments by land:
This material is not regulated for transport.

For bulk shipments by land:
COMBUSTIBLE LIQUID, N.O.S. (TRIETHYLAMINE, ETHANOL)/COMBUSTIBLE LIQUID/NA1993/PGIII

For shipments by air or vessel:
FLAMMABLE LIQUIDS, N.O.S. (TRIETHYLAMINE, ETHANOL)/3/UN1993/PGIII

15. REGULATORY INFORMATION:

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

U.S. REGULATIONS

SARA 313 INFORMATION: This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

CHEMICAL NAME	CAS NUMBER	CONCENTRATION
N,N-Diethylethanamine	000121-44-8	3%

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A delayed health hazard
A fire hazard

TOXIC SUBSTANCES CONTROL ACT (TSCA): All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

MATERIAL SAFETY DATA SHEET

Emergency Phone: 800-992-5994
Dow AgroSciences LLC
Indianapolis, IN 46268

GARLON* 3A HERBICIDE

Effective Date: 11/24/03
Product Code: 38321
MSDS: 004422

STATE RIGHT-TO-KNOW: The following product components are cited on certain state lists as mentioned. Non-listed components may be shown in the composition section of the MSDS.

CHEMICAL NAME	CAS NUMBER	LIST
Ethylenediamine Tetraacetic Acid	000060-00-4	NJ3 PA1 PA3
Ethanol	000064-17-5	NJ1 NJ3 PA1
N,N-Diethylethanamine	000121-44-8	NJ1 NJ3 PA1 PA3

NJ1=New Jersey Special Health Hazard Substance (present at > or = to 0.1%).
NJ3=New Jersey Workplace Hazardous Substance (present at greater than or equal to 1.0%).
PA1=Pennsylvania Hazardous Substance (present at > or = to 1.0%).
PA3=Pennsylvania Environmental Hazardous Substance (present at > or = to 1.0%).

OSHA HAZARD COMMUNICATION STANDARD: This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS:

CATEGORY	RATING
Health	3
Flammability	2
Reactivity	0

COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA, or SUPERFUND): This product contains the following substance(s) listed as "Hazardous Substances" under CERCLA which may require reporting of releases:

Chemical Name	CAS Number	RQ	% in Product
Triethylamine	000121-44-8	5000	3%
Ethylenediaminetetra-acetic Acid (ETDA)	000060-00-4	5000	2.3%

RCRA Categorization Hazardous Code:
Triethylamine = U404

16. OTHER INFORMATION:

MSDS STATUS: Revised Section: 3, 4, 8, 11 & 14
Reference: DR-0121-6064
Replaces MSDS dated: 1/17/01
Document Code: D03-101-003
Replaces Document Code: D03-101-002

The Information Herein Is Given In Good Faith, But No Warranty, Express or Implied, Is Made. Consult Dow AgroSciences for Further Information.

Fiche signalétique

Phytocide Garlon* 4

*Marque de commerce de Dow AgroSciences - Dow AgroSciences Canada Inc. est un usager autorisé.

En cas d'urgence appeler le 519 339-3711

1. Identification du produit:

Nom du produit: Phytocide Garlon* 4
Numéros de code: 38322
N° de GMID: 4510, 5652
N° de la FS: DASCI-F012
Entrée en vigueur: 2 avril, 2002
Imprimée le: 3 avril, 2002

Fournisseur:
Dow AgroSciences Canada Inc.
1144 - 29 Avenue N.E.
Calgary, Alberta,
Canada, T2E 7T1
www:dowagro.ca

Ce produit est réglementé en vertu de la Loi sur les produits antiparasitaires

2. Composition:

Ingrédient	Numéro CAS	% (en masse)
Triclopyr (sous forme d'ester butoxyéthylique)	064700-56-7	61,6
Autres ingrédients		38,4
à savoir:		
Kérosène	008008-20-6	
Éther butylique de l'éthylène glycol	indisponible	
Surfactifs exclusifs	indisponible	

3. Renseignements sur les dangers

Aperçu des risques:
Ce produit est un liquide ambré qui dégage une odeur de kérosène. Ce produit est combustible. Le contact peut causer une irritation des yeux et de la peau.

Précautions spéciales: Ce produit contient un solvant à base de pétrole. Des études sur la santé montrent que bon nombre de solvants à base de pétrole constituent des risques potentiels pour la santé, lesquels peuvent varier d'une personne à l'autre. Comme précaution, il faut réduire au minimum l'exposition aux solvants contenus dans ce produit, que ce soit sous forme de liquide, de vapeurs, de brouillard ou de fumées.

Effets possibles sur la santé:
Yeux: Ce produit peut causer une légère irritation passagère. La survenue de lésions cornéennes est peu probable.
Contact cutané: Des expositions prolongées ou répétées peuvent causer des irritations cutanées.
Absorption cutanée: Une exposition prolongée risque peu d'entraîner l'absorption de quantités nocives. Par contre, des expositions répétées peuvent entraîner l'absorption de quantités nocives.
Ingestion: Les petites quantités accidentellement ingérées par suite d'une exposition professionnelle normale risquent peu de causer des lésions. Par contre, l'ingestion de grandes quantités peut en causer. Du liquide peut être aspiré dans les poumons par suite d'une ingestion ou de vomissements, ce qui peut entraîner des lésions pulmonaires ou même la mort en raison d'une pneumonie chimique.
Inhalation: Une exposition excessive peut irriter les voies respiratoires supérieures. L'inhalation de kérosène peut avoir des effets sur le système nerveux central.

4. Premiers soins:

Contact avec les yeux: Rincer à grande eau pendant plusieurs minutes. Enlever ses lentilles cornéennes au bout de une ou deux minutes, puis continuer à rincer pendant encore plusieurs minutes. Si des effets se manifestent, consulter un médecin spécialiste.
Contact avec la peau: Rincer à grande eau ou sous la douche.
Ingestion: Ne pas faire vomir à moins de directives contraires de la part d'un professionnel de la santé. Obtenir des soins médicaux et transporter à un établissement médical sur-le-champ.
Inhalation: Amener la personne à l'air frais. Si elle a de la difficulté à respirer, une personne qualifiée doit lui administrer de l'oxygène. Si elle ressent des effets, lui faire voir un médecin.

Note au médecin:
Ce produit contient un solvant à base de pétrole. En cas d'ingestion, le médecin traitant doit décider s'il y a lieu de faire vomir ou non. Si un lavage est effectué, il est suggéré d'exercer un contrôle endotrachéal et/ou oesophagien. Avant

de procéder à un lavage gastrique, il faut mettre en balance les effets toxiques et les risques associés à une aspiration dans les poumons. Assurer des soins de soutien. Le médecin doit décider des particularités du traitement en fonction des réactions du patient.

5. Mesures de lutte contre le feu:
Température d'allumage spontané: indisponible
Point d'éclair: 64°C (Tagliabue en vase clos)
Limites d'inflammabilité: non déterminées
Agents d'extinction: brouillard d'eau, mousse, CO2, poudre chimique
Sensibilité au choc/à la décharge d'électricité statique: aucune donnée de disponible
Risques d'incendie et d'explosion inhabituels: Ce produit est combustible. Sous l'action du feu, ce produit peut dégager des vapeurs toxiques irritantes. Contenir l'eau de lutte contre l'incendie afin de l'éliminer ultérieurement.
Matériel de lutte contre l'incendie: Porter une tenue de feu complète et un appareil respiratoire autonome à pression positive intermittente.

6. Mesures à prendre en cas de rejet accidentel:
Dans le cas d'un petit déversement, nettoyer les lieux avec une matière absorbante. Éviter d'utiliser de l'eau. Si toutefois on utilise de l'eau pour nettoyer les lieux, la contenir et s'en débarrasser en conformité avec le paragraphe 13 intitulé «Information sur l'élimination». Le triclopyr est un herbicide qui agit sur bon nombre de plantes à feuilles larges y compris différents arbres et arbustes. Éviter de contaminer le sol près de la végétation que l'on désire protéger. Faire en sorte que le produit déversé ne contamine pas les réserves d'eau. En cas de gros déversements, endiguer et barricader la zone, éliminer les sources d'inflammation et aviser Dow AgroSciences au 519 339-3711.

7. Manipulation et entreposage:
Manipulation: Garder hors de la portée des enfants et des animaux. Ne pas utiliser près de sources de chaleur ou de flammes nues. L'ingestion, l'inhalation ou l'absorption cutanée de ce produit entraînent des effets nocifs. Éviter tout contact avec les yeux, la peau et les vêtements. Retirer et laver les vêtements contaminés avant de les porter à nouveau. Laver les vêtements contaminés séparément de la lessive domestique, puis les faire sécher sur la corde. Après avoir lavé les vêtements contaminés, faire fonctionner la machine à laver pendant un cycle complet avec seulement de l'eau chaude et du savon, avant de l'utiliser à nouveau pour la lessive de tous les jours. Se laver les mains et le visage avant de manger, de boire, de mâcher de la gomme, de fumer ou d'aller aux toilettes.
Entreposage: Conserver ce produit à une température supérieure à -2°C ou agiter avant de s'en servir. Ne pas transporter ou entreposer avec des denrées alimentaires, des aliments pour animaux, des semences ou des vêtements.

8. Normes d'exposition, protection individuelle et limites d'exposition:
Normes d'exposition:
Triclopyr (ester butoxyéthylique): Norme d'hygiène industrielle de Dow: 2 mg/m³, comme équivalent acide, peau
Kérosène: Norme d'hygiène industrielle de Dow: 10 mg/m³
Surfactants exclusifs: indisponibles
Mesures d'ingénierie: Assurer une ventilation de tirage générale et/ou locale pour maintenir la concentration des contaminants atmosphériques au-dessous des limites d'exposition.
Protection respiratoire: Maintenir la concentration des contaminants atmosphériques au-dessous des limites d'exposition. Lorsqu'une protection respiratoire est requise pour certaines activités, porter un respirateur à adduction d'air filtré homologué.
Vêtements de protection: Pour de brefs contacts durant la fabrication, l'entreposage et le transport, porter des vêtements de protection propres. S'il y a des risques d'exposition au produit concentré, porter des vêtements de protection ne laissant pas passer ce produit. Selon l'opération à effectuer, porter un écran facial, un respirateur, des bottes, des gants, un tablier ou une tenue de protection complète. Les opérateurs et les autres travailleurs dans le champ, incluant les personnes qui réparent ou nettoient le matériel d'épandage, doivent porter des vêtements de protection propres, des gants et des bottes imperméables. De plus, les personnes qui préparent les dilutions pour le champ et/ou qui les transfèrent doivent porter un tablier imperméable.
Protection des yeux: Porter des lunettes de sécurité.
Autre protection: aucune mention

9. Propriétés physiques et chimiques:

Point d'ébullition: 150°C
Pression de vapeur: 0,1 mm Hg à 37,8°C (kérosène)
Densité de vapeur: >1
pH: indisponible
Apparence: liquide ambré
Odeur: semblable à celle du kérosène
Coefficient de répartition eau/huile: indisponible
Densité: 1,08
Vitesse d'évaporation: indisponible
Solubilité dans l'eau: émulsifiable
Point de congélation: indisponible
Seuil olfactif: indisponible

10. Stabilité et réactivité:
Stabilité: Ce produit est combustible. Éviter les sources d'inflammation si la température avoisine ou dépasse le point d'éclair (64°C). Ce produit est stable dans des conditions de stockage normales.
Incompatibilité: Acides, bases et matières oxydantes
Produits de décomposition dangereux: En cas d'incendie, le produit pourrait dégager du chlorure d'hydrogène, des oxydes d'azote et du phosgène.
Polymérisation dangereuse: Ne se produira pas

11. Données sur la toxicité:
Absorption cutanée: DL 50 : >2000 mg/kg (lapin) et >5000 mg/kg (rat).
Ingestion: DL 50 (rat): 1581 mg/kg (mâle) et 1338 mg/kg (femelle).
Inhalation: données indisponibles
Sensibilisation: Des expositions cutanées prolongées ou répétées fréquemment peuvent causer des réactions allergiques chez certaines personnes. Le produit dilué pour le champ ne devrait pas causer de réaction cutanée allergique.
Effets chroniques: Des expositions excessives répétées peuvent avoir des effets sur le foie, les reins et le sang.
Cancer: Le triclopyr (ester butoxyéthylique) n'a pas causé le cancer dans les études animales de longue durée. Dans une étude animale longitudinale sur la cancérogénicité cutanée, on a constaté une augmentation de l'incidence des tumeurs de la peau lorsque le kérosène était appliqué à des doses qui avaient aussi produit une irritation cutanée. La réaction cutanée était similaire à celle que produisent d'autres types d'irritation chimique/physique chronique. L'application de doses équivalentes de dilutions de kérosène non irritantes n'a pas entraîné une augmentation des tumeurs, ce qui indique que le kérosène risque peu de causer un cancer de la peau en l'absence d'une irritation cutanée continue à long terme. Dans les études animales de longue durée sur l'éther butylique de l'éthylène glycol, on a constaté une augmentation faible mais statistiquement significative de tumeurs chez les souris mais pas chez les rats. On ne croit pas que ces effets puissent survenir chez l'homme. Si le produit est manipulé en conformité avec les normes de manipulation industrielle établies, une exposition au produit ne devrait pas constituer une risque cancérogène pour l'homme.
Anomalies congénitales: Il est peu probable que le triclopyr (ester butoxyéthylique) entraîne des anomalies congénitales. Les expositions qui n'ont aucun effet sur la mère ne devraient pas causer d'effets chez le fœtus. Le triclopyr n'a pas entraîné d'anomalies congénitales dans les expérimentations animales; on a constaté d'autres effets chez le fœtus mais seulement à des doses qui ont causé des effets toxiques à la mère.
Effets sur la reproduction: Dans les expérimentations sur des animaux de laboratoire, le triclopyr (ester butoxyéthylique) n'a eu des effets qu'à des doses ayant produit des effets toxiques considérables chez les parents.
Mutagénicité: Selon les résultats des études in vitro et chez l'animal, le triclopyr n'a pas de pouvoir mutagène.

12. Incidence sur l'environnement:
Le triclopyr (acide) est considéré comme non toxique pour les abeilles. Le triclopyr (acide) est moyennement toxique pour les poissons et les invertébrés aquatiques par suite d'une exposition aiguë. Le triclopyr (acide) est légèrement toxique pour les oiseaux par suite d'une exposition aiguë. Le potentiel de bio-concentration du triclopyr (acide) est faible. Pour obtenir de plus amples renseignements sur l'écotoxicité, communiquer avec Dow AgroSciences au 800 667-3852.

Dégradation et métabolisme:
Dans le sol: Il se produit une dégradation assez rapide du triclopyr par activité microbienne et la demi-vie moyenne est de 46 jours, selon le sol et les conditions climatiques. Le principal produit de dégradation est le 3,5,6-trichloro-2-pyridinol (dont la demi-vie dans le sol varie entre 30 et 90 jours);

on trouve aussi une petite quantité de 3,5,6-trichloro-2-méthoxypyridine.
Dans les végétaux: Dans les végétaux, la demi-vie du triclopyr va de 3 à 10 jours. Le principal métabolite est le 3,5,6-trichloro-2-méthoxypyridine.
Chez les animaux: Chez les mammifères, par suite d'une administration par voie orale, l'excrétion se fait principalement dans l'urine sans que le composé ne subisse de modifications. Les métabolites urinaires secondaires sont donnés dans C. Timchalk et al, Toxicology, 1990, 62, 71.

13. Information sur l'élimination:
Produit non voulu inutilisé: Consulter Dow AgroSciences ou l'organisme de réglementation provincial.
Élimination des contenants: Nettoyer et éliminer les contenants vides en suivant les instructions qui figurent sur l'étiquette du produit. S'il n'y a pas d'instructions ou que les instructions sont ambiguës, consulter Dow AgroSciences au 800 667 3852 ou l'organisme de réglementation provincial.

14. Information sur le transport:
Pour connaître la classification de ce produit dans la Loi sur le transport des marchandises dangereuses, communiquer avec le centre des solutions de Dow AgroSciences au 800 667 3852.

15. Information réglementaire:
Numéro d'enregistrement - Loi sur les produits antiparasitaires: 21053
Pour de plus amples renseignements, composer: 800 667-3852
Fiche maîtresse: 004788
État de la FS: Sections révisées:
1. Identification du produit
2. Composition
3. Renseignements sur les dangers
4. Premiers soins
7. Manipulation et entreposage
10. Stabilité et réactivité
11. Données sur la toxicité
12. Incidence sur l'environnement
13. Information sur l'élimination
16. Autres renseignements

Remplace la fiche signalétique datée du: 11 avril 2000

16. Autres renseignements:
Classement selon le Code national de prévention des incendies: classe 3A
Indices de la NFPA: Santé**:** 2; Inflammabilité**:** 2; Réactivité**:** 1
Avis: Les renseignements que contient la présente fiche signalétique sont estimés exacts à la date d'entrée en vigueur précisée plus haut à la section 1 et sont susceptibles de changements par Dow AgroSciences Canada Inc. (DASCI) à tout moment. DASCI n'accepte aucune responsabilité qui pourrait résulter de quelque façon que ce soit de l'utilisation de fiches signalétiques qui ne sont pas publiées par DASCI, ou qui ont été modifiées sans l'autorisation écrite expresse de DASCI. Les utilisateurs de la présente fiche signalétique doivent s'assurer qu'ils ont en main la version autorisée la plus récente de cette fiche signalétique et doivent assumer toute responsabilité à cet égard. Toute incohérence ou toute anomalie dans le contenu de la présente fiche signalétique doivent être résolues en se référant à la plus récente version de la fiche publiée par DASCI.